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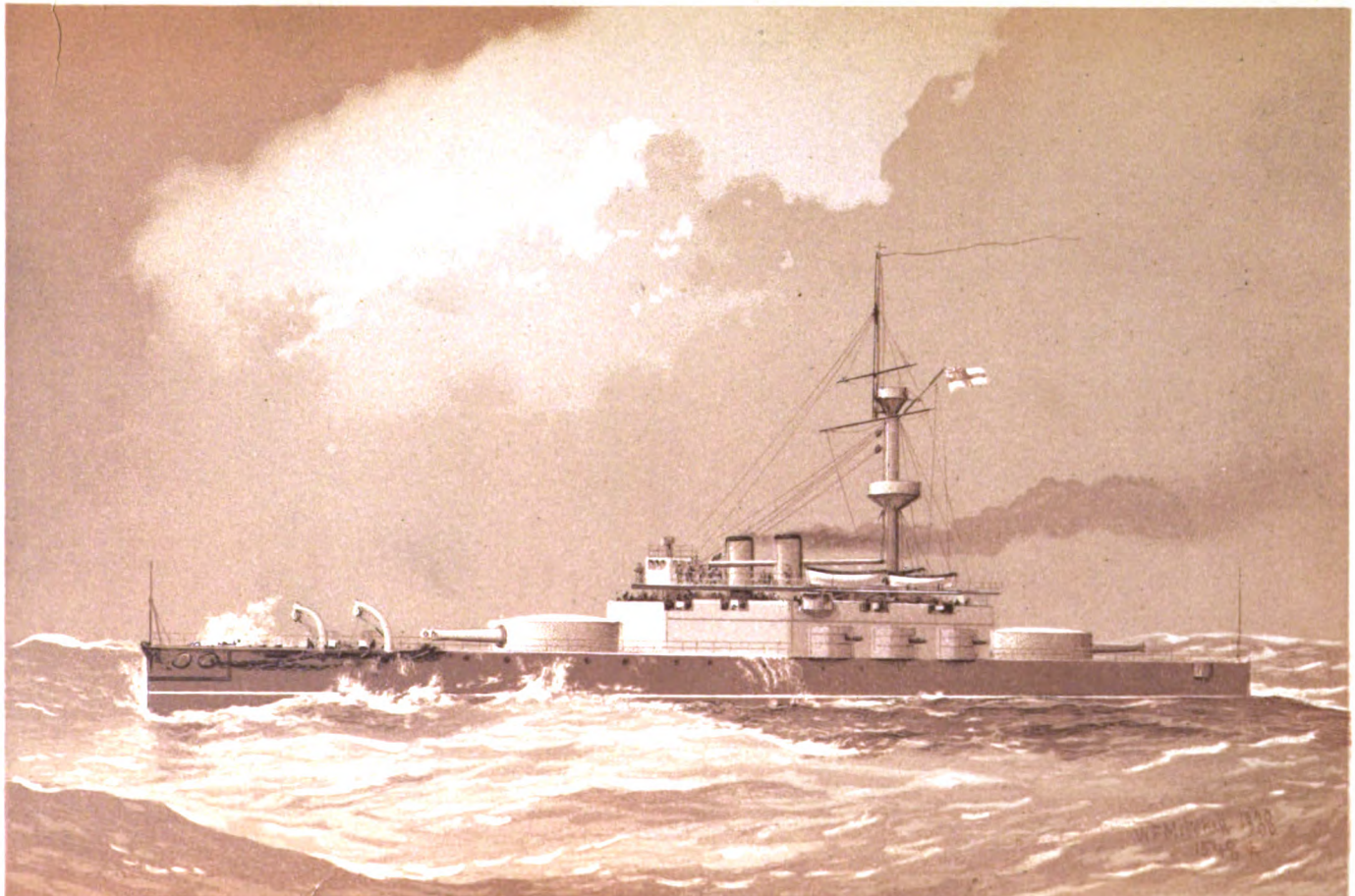

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THE

NAVAL ANNUAL,

1888-9.

PART I.—LORD BRASSEY, K.C.B.

PART II.—F. K. BARNES, Esq., M.I.N.A.

PART III.—Major ORDE BROWNE, late R.A.

PART IV.—STATISTICS, OFFICIAL STATEMENTS AND PAPERS.

"The English, one can discern withal, have been perhaps as brave a People as their neighbours; perhaps, for Valour of Action and true hard labour in this earth, since brave Peoples first were made in it, there has been none braver anywhere or anywhen."—CARLYLE. "Anti-dryasdust" (*Introduction to Oliver Cromwell's Letters and Speeches.*)

"He would spend £100,000,000 rather than allow our naval supremacy, on which the very existence of our commerce depended, to be threatened."—COBDEN.

1889.

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WITH the view of giving the British Navy Estimates for the current year, side by side with those of the leading maritime powers, it has been determined to postpone the publication of *The Naval Annual* to a later period of the year. It is hoped that the change will be approved, as facilitating those comparisons on which the policy of the Admiralty, as embodied in the Navy Estimates, must mainly depend.

It will not be necessary to enumerate once more in the Preface the ably-conducted and well-informed journals from which *The Naval Annual* is mainly compiled. It has been desired to acknowledge in each case in the body of the work the source from which matter has been borrowed.

As an annual summary of the events of the year, drawn from widely scattered sources, it is hoped that the compilation of *The Naval Annual* may be of real service to those interested in naval affairs.

The NEW PROGRAMME of construction is the great incident of the past year. A forward movement on the part of the Naval Administration of the British Empire had become necessary in view of the active efforts of other Powers.

The year 1888 has been darkened by the loss of some distinguished ornaments of the naval profession. The members of Lord Northbrook's Board remember with affection their colleague, Sir Cooper Key. In Sir William Hewett the Navy has lost a great leader.

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PART I.

CHAPTER I.

IMPERIAL DEFENCE.

REAR-ADMIRAL P. H. COLOMB.

The study of imperial defence.

WITHIN the last few years the minds of both soldiers and sailors have been steadily at work on the study of Imperial Defence, and though it cannot be said that many canons relating to that subject have been universally accepted, it is not to be doubted that all our ideas on the matter are clearer than they were. Not only so, but month by month the points of difference have been defined, have narrowed the issues, and cleared the controversial field. I may be pardoned, perhaps, for assigning to my brother, Sir John Colomb, the leading part in laying down and continually differentiating the governing principles of Imperial Defence. He took up the study more than twenty years ago, at a time when it had not been touched; and in his first pamphlet, 'The Protection of our Commerce, and Distribution of our War Forces Considered,' which was published in 1867, may be fairly said to have given the key-note to all the subsequent discussions. He followed up this paper with a number of others, all clinging closely to the main principles first enunciated, while working out the subordinate grouping of the details which were necessary to make a complete scheme. Many military writers have contributed to the elucidation of the great subject, but it has been a misfortune that, as a rule, military men have closed their eyes to the long series of principles within which it is necessary to work, and have treated their own proper functions in plans of defence as if there were nothing outside them, nothing limiting or governing the details. With many of them the local defence of the land of each locality has been the be all and end all of their purview; they have very generally agreed that the communications between localities separated by water has been no part of their business to study or consider, and they have adopted the position that the idea of such existing com-

Sir John Colomb.

His pamphlet gave the key-note.

Military writers on the subject.

Some of their views.

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munications must be ignored. This erroneous method of dealing with the question—for the moment we suppose open communications we alter all the conditions of the problem—seems really to have originated in the Duke of Wellington's famous letter, improperly published in 1847, not so much in the words of the letter itself, as in a curious consensus of determination to drop the limiting words used in the letter as if they had never been there. And yet the limiting words on the one side, and the very small addition to our means of military defence against invasion asked for (and long ago doubled) on the other, were of the very essence of the Duke's thought.

The Duke of Wellington's famous letter.

This is what the Duke said to Sir John Burgoyne:—

Duke of Wellington to Sir John Burgoyne.

"You are aware that I have for years been sensible of the alterations produced in maritime warfare and operations, by the application of steam to the propelling of ships at sea. This discovery immediately exposed all parts of the coasts of these islands, which a vessel could approach at all, to be approached at all times of the tide, and in all seasons, by vessels so propelled, from all quarters. We are in fact assailable, and at least liable to insult, and to have contributions levied upon us on all parts of our coast; that is the coast of these, including the Channel, Islands, which to this time, from the period of the Norman Conquest, have never been successfully invaded. . . . . I have in the above words represented our danger. We have no defence, or hope of defence, excepting in our fleet. . . . . *But as we stand now, and if it be true that the exertions of the fleet alone are not sufficient to provide for our defence, we are not safe for a week after the declaration of war.* . . . . In that space of coast" (that is, between the North Foreland and Selsey Bill) "there are not less than seven small harbours or mouths of rivers, each without defence, of which an enemy, having landed his infantry on the coast, might take possession, and therein land his cavalry and artillery of all calibres, and establish himself *and his communication with France.*"

Limiting conditions.

I have printed what I consider to be the limiting conditions of the Duke of Wellington's alarmed views in italics; from which it appears that, could he have been assured by the naval officers of that day either that the fleet was sufficient to provide for our defence, or that it could prevent a French force landed on our coast from maintaining its communications with France, his alarm would have subsided. But even when he was far from being assured on these points, he professed that he would be amply satisfied with additions to our military forces which have long been exceeded. Taken apart not only from the limiting expressions, but from the immense changes in all the conditions which have come about since the Duke

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wrote, we may freely admit that this celebrated document formed a sort of military charter for the localization of the defences of the Empire. For if the British Islands were to be properly and efficiently defended by local works and local military forces, so could every separate part of the Empire be defended by like local means. So also could each town, port, estuary, or coast entrepôt, be kept scatheless from the enemy's touch by military and local means.

Military charter.

And the converse of the proposition might, on the same grounds, be defended. If the security of our own communications across the water could not be maintained, if those of the enemy could not be destroyed, the whole value of communications by sea was lowered. It followed that more stress must be laid upon the local powers of resistance of each item of territory composing the British Empire, and less attention should be paid to the defence of the communications between these items. Communications were not of the essence of Imperial defence; it was lucky for the Empire that they were not, for they could not be preserved in war.*

. This appears to me to be the kernel of the military thought for very many years past. "The absence of the fleet" was the major premiss, not only in military writings on imperial defence, from that wonderful and stirring romance—the Battle of Dorking—through all its imitations and through all the serious papers which military men have put forth. Not only so, but it was the same when views passed into acts of expenditure on defensive arrangements. The Navy was at first quite neutral on the subject, a great portion of the Navy is neutral still. It generally held that it was in no way concerned with military expenditure. It laughed a little at the easy disappearance of the naval forces, either to the bottom by means which were miraculous in their effects—if that which is contrary to all ex-

The kernel of the military thought for some years past.

* As an instance, I quote from a paper by Captain Stone read at the United Service Institution, with Lord Wolseley in the chair, on January 18. "My premiss is that the possession of Naval arsenals, dockyards, and coaling stations must practically decide the question of Naval supremacy; that such supremacy is absolutely essential to our existence as a nation; and that the way to secure it is to fortify and arm our own arsenals, dockyards, and coaling stations in such a fashion as to enable them to resist an enemy's attacks, and at the same time to give a free hand to the Navy to attack those of the enemy with such force as may be available, after providing for the patrolling of our principal trade routes." And then the line, or atmosphere, of thought generated by this enunciation of principles culminates in such an idea as the following: "The case of Sevastopol is even more instructive, affording as it does an actual parallel to cases with which we may ourselves have to deal in the event of an invasion of our territory." That is to say, that the complete loss of command of the sea, and the placing of it absolutely in the hands of our enemies, is not recognized as a death-blow to the Empire, so long as spots of territory can be kept intact.

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perience is miraculous—or by decoy and delusion which rested on the slender basis of an argument historically sound so far as it regarded sailing ships only. But when the Navy laughed, it did so in its sleeve, and the military mind was allowed to pursue the train of thought it had fallen into, with very little check indeed from the naval mind, which ought to have been busy with friendly and useful criticism. The Navy went further sometimes, and directly countenanced the military theory that it could neglect communications with the vital points of territory if only each point were rendered individually secure. It to a great extent took up the simple idea which has everything on the surface to recommend it, and can hardly be shaken by anything but exceedingly close reasoning, that the local security of a mercantile port would always free the ships which would otherwise be necessary for its protection. The idea may have been the outcome of establishing as a fundamental principle the minor value of communications by sea. The Navy itself was becoming permeated by the idea that in the next naval war it would have something to do which was not concerned in maintaining communications. What the something else was, has I believe to this day been left undefined. The full idea was promulgated by the Royal Commission of 1859–60, where the enormous sums to be spent on the local defences of Portsmouth, Plymouth, the Thames, and the Medway, were recommended and justified on the plea that the country would never stand the expense of maintaining a Channel fleet sufficiently powerful to cover these ports, and therefore to preserve their water communications.* Yet, had we not allowed ourselves to fall into the strategical errors which we in our mistaken unconcern had permitted to the military mind, we could never have stopped at that point. If the country would not provide a Channel fleet sufficient to cover these ports, what followed? What was meant by not providing a Channel fleet sufficiently powerful for the purpose? Was it meant that with all our forces assembled in the Channel we should still be too weak, or was it supposed that the something else which was not to be named would prevent such concentration? It is perhaps indisputable that it was the latter condition which was implied. But if so, then it was assumed that the communications over water of Plymouth, Portsmouth, and the Thames were to disappear, and might disappear without great harm, provided these three points were themselves made secure from capture and occupation.

Royal Commission of 1859-60.

Sir John Colomb, for the first time, and I believe alone, ran a tilt

* It is now scarcely conceivable that such an argument could ever have been put forward except in joke.

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against all these ideas in his pamphlet of 1867, and especially in the following passages:

Sir John Colomb's pamphlet of 1867.

"The distribution of the forces for the protection of our Commerce is a most important, and, at the same time, a most difficult problem to solve. The magnitude of this national requirement is only equalled by the difficulty of meeting it with the means at our disposal. Like everything else upon a gigantic scale, it can only be accomplished by the proper application of general principles. Now, in all naval and military operations, whether offensive or defensive, there is a golden rule, to neglect which is certain ruin; it is the fundamental law which applies to all warfare, and is simply this—that the success of all operations depends upon the disposition of the forces in such a manner as will best secure the base of operations, and ensure safety and freedom of communication. Knowing this to be true, it remains with us to show how far it can be acted upon, and applied to the object in view.

"To determine the base of operations we look at a commercial chart, which is nothing more or less than a map of the world, showing the tracks of thousands of ships passing and re-passing from one part of the globe to another. We know that on the proper distribution of our forces depends the safety of these innumerable vessels, and that this involves the prosperity, nay, the very existence, of the British Empire in time of war. It is in reality the income of the nation which is thus scattered broadcast over the ocean. On examining this chart, it appears that all the tracks radiate from one point—the Channel—and that there by far the greatest number of laden ships are collected. One half of all the ships we are to protect are at and round this point. The Channel is the key of the position, the vital spot to secure against surprise, and it must ever be the base of our naval operations throughout the world.

"Now, the same law to which we have referred exists with equal force in all commercial enterprises. The base of all mercantile operations is money; investments may be regarded as the advanced posts of monetary warfare. Upon the freedom of communication depends the safety of the enterprise.

"Take, for instance, one of the great banks which lately failed. We are told the cause of the disaster was that the capital, *i.e.*, the money, was locked up; the power to call in the advanced posts to the relief of the base, or capital, was wanting; the lines of communication were cut off by pressure from without, and the whole monetary edifice fell to the ground.

"We may look upon the Empire as an immense commercial speculation. The base of operations is English money which is laid out in investments in all parts of the world. Upon the freedom of communication the commercial existence of the Empire depends. From this point of view, the greatest calamity which can befall this gigantic enterprise is that pressure from without which would threaten to cut off the greatest number of its communications. That danger may, any day, assume a very visible form in the shape of a powerful foreign fleet in the Channel. The capital of the greatest commercial enterprise in the world could not be more effectually locked up than by the suspension of 'imports' and 'exports' which would, as a consequence, follow such a contingency.

"For the reasons we have briefly given, it is evident that the safety of the Channel must be maintained; and that it is worse than useless to distribute the forces for the protection of our commerce over various parts of the world, while the base of our Naval operations, the most vital spot in our commercial system, remains insecure. As this involves the employment of a large sea-going fleet for Channel service only, it is advisable to ask the question, Will not a fleet sufficient for this purpose be equal to the task of protecting England from invasion?"

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The argument in these passages is very clear, and, if it is true and complete, it must govern the whole strategy and art of defence of a maritime Empire.

The two opposing ideas.

In such defence there must always be the two opposing ideas—that of the defence of each spot of territory apart from all the rest; and that of the defence of the water connecting the spots of territory considered, with the spots of territory, as a whole. It may easily be held, indeed often is held, that the two ideas are not antagonistic, but can be embodied and acted on, side by side. I believe such an argument cannot be sustained. As a fact, we know the thing is not so. No agreement has ever been come to in this Empire of ours as to how far the defence of spots of territory shall be carried, or how far their safety shall be left to be determined by the security of their communications. All we recognise in practice is that there is not anywhere in the Empire a spot which has sufficient local

Strategic centres.

defence, and this is equally the case with such great strategic centres as Portsmouth, Plymouth, Gibraltar, and Malta, as with such lesser centres as Albany and Thursday Island. No doubt, opinion is not unanimous. There are high authorities who consider Portsmouth and Plymouth overdone with works; and in the last number of this *Annual* the great expenditure on Bermuda and Dover was condemned. But still, in the result, it is found that the argument of local defencelessness always prevails, and expenditure everywhere goes on in recognition of it. But never, I believe, is expenditure undertaken except on the basis of the failure of communications. That is to say, never are the land defences, or even perhaps the strictly local naval defences, intended to combine in any way with the general naval defence. This is invariably supposed to be absent; that is to say, the communications are, at any rate for the time, supposed to be cut.

The Royal Commissioners of 1859–60.

The question appears to be whether there is any other way of considering it. The Royal Commissioners of 1859–60 were unable to combine the two ideas of defence, and their justification of the very heavy expenditure on the fortifications of Portsmouth and Plymouth rested on the sole ground that the defence of their sea communications "would involve the necessity of retaining in the Channel, for purely defensive purposes, a fleet equal to any which could be brought against it, not only by one European State, but by any probable combination of maritime powers, &c." It was not as the complement—as it has been put by distinguished officers—of the defence of the communications that the great defensive works were to be taken in hand, but on the clear understanding that this would be abandoned

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altogether. The local defence of the spots of territory was the alternative and opposing system of defence, and not the completion or adjunct of the other—the defence of the communications. Sevastopol may possibly afford us an illustration in point. When the British prepared to undertake its capture or destruction, there was attached to the port a very considerable fleet. The port itself was also strongly fortified and heavily garrisoned. The naval defence would have been complete if it had been able to prevent the landing at a distance from the port; failing to do or to attempt this, it collapsed, and the ships became useful for nothing but to be sunk so as to bar the entrance to the harbour. The port finally fell to the possessor of free water communications. But it would not have fallen, for the invading expedition could not have started, had the Russian water communications been complete, and had those of the British been interrupted. After the siege was established, there was a certain threatening by the Russian steam ships which remained protected by the fortifications within the harbour to interfere with the naval operations of the British. But evidently such attempts have either nothing to do with the present argument, or tend to confirm the view that the local defence of the spot of territory, and its defence by the preservation of its communications, *are not concomitant*. The threats of the Vladimir, such as they were, corresponded only to proposed sorties of the garrison, and so far formed a part of, and were subordinate to, the land defences only.

Sevastopol.

Threats of the Vladimir.

Sevastopol forms the converse of the lines of Torres Vedras. Sevastopol fell when attacked by sea and by forces resting on the sea; Torres Vedras successfully resisted when invested by land, but with its communications by sea intact. In both cases it was the holder of the sea communications who succeeded. But it was the sea communications which formed the complement of the Duke of Wellington's works; while in the case of Sevastopol the works stood alone.

Torres Vedras.

The case of Gibraltar is again analogous to that of Torres Vedras, and the converse of Sevastopol and of all successful attacks from the sea, while it has differentiating features from the defence of the Lisbon territory. In 1780 this fortress was nearly starved out because the British had allowed its communications by sea to be cut. It must have fallen, had not Rodney, in January, 1780, restored those communications, and re-victualled the place. But next year it was the same thing again. Gibraltar was on the point of being starved out, when Admiral Darby relieved it with a convoy of 100 store ships in 1781. But both these attempts were desultory, and neither resulted, nor were intended

Gibraltar.

Admiral Rodney.

Admiral Darby.

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to result, in permanently restored communications. And this probably for the reason that, except for the protection of Gibraltar, there was no object in keeping command of the adjacent waters. Our commerce thitherwards was insignificant, and so far from Gibraltar forming a base on which the Navy could rest, it was a great tax on the Navy of that day merely to preserve it. In February, 1782, Minorca, fortified and garrisoned, but with its sea communications cut, succumbed to the enemy whose communications were open. Gibraltar, however, withstood the tremendous attack by bombardment, chiefly from the sea, of September in that year, but would subsequently have succumbed to starvation, had it not been relieved by Lord Howe with the great force of 26 sail of the line.

Fall of Minorca.

The conditions of Torres Vedras and Gibraltar were therefore alike in so far as they depended upon the sea for supplies; they were not alike in so far as the sea communications were permanently open in the one case, and intermittently open in the other. Minorca, unrelieved from the sea, fell; Gibraltar, relieved from the sea, maintained its defence.

But none of these cases could represent Portsmouth and Plymouth, as their supplies would come by land, and they could not be invested from the sea only. Again, neither Lisbon nor Gibraltar were at the times mentioned naval strategical points. At the moment it was of no consequence to naval operations whether they fell or stood. They were defended not as present bases, but as future possible naval bases, or perhaps, in the case of Gibraltar, only as a portion of territory which honour and not utility forbade the British to part with. What appears to be certain is, that had it been necessary to maintain the sea communications with Gibraltar for purposes other than the defence of the garrison, not only would the command of the sea round Gibraltar have been preserved, but such preservation would have prevented all attempts to reduce the place either by bombardment or investment. As it was, the British naval force at the bombardment of Gibraltar was so small that it could only co-operate by landing the crews to man the shore batteries.

Landing ships' crews to man the shore batteries.

So far, we do not appear to get a connection between the local defence of the spot of territory and the defence of its communications by water. It seems quite impossible to say in what way the local defence by works and garrisons can assist the defence of the communications, though it is clear enough why maritime nations which have little hope of maintaining sea communications should fall back on the local defence of the spots of territory. The maintenance of sea communications involves the safety of the place communicated with.

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But we seem from this cursory examination to observe that what local and fixed defence is good for is only as a substitute for naval defence when the sea communications, either by accident or design, may be abandoned. There is little sign that the position of a fleet can be strengthened by works for defensive purposes as the position of an army can be. Nor do we easily get, in any form, a defence which combines both descriptions of passive force.

The questions that occur, and require answering whenever the amount of local defence to be given to a spot of territory is in debate, appear to be whether, apart from the defence of the place, it is necessary to maintain its sea communications, or whether these may be abandoned without material loss to the Empire, provided that the spot of territory can maintain itself apart from them? If the place to be defended is a mercantile port, a port of call, or in the track of a great stream of commerce, but is not otherwise of importance, the communications of the place by sea are of more importance than the place itself, and it would be almost strangely uneconomical to expend upon the place itself, until every possible effort had been made to insure the maintenance of the communications with it; for the place cannot be touched as long as the communications are intact; and as the place without its communications is of minor value, we should have been sparing where we should have spent, and spending where we should have spared.

Where communications are more important than the place.

It may be proper to take the opposite view in the case of spots of territory where communications may be intermitted without loss, at any rate for a time, but which must be preserved for special reasons. Here the non-maintenance of communications invites and allows attack, and it may be more economical to prepare the place itself to sustain it.

The opposite case.

In the days of sailing ships all communications by sea were more uncertain than they are now, and every day the means of maintaining them improve. On the other hand there is little reason to suppose that the time necessary for the reduction of a place, or the cost of the reduction, have materially diminished, if it can be said that they have not increased.* So far the power of local defence is increased; or to put it the other way, the necessity for heavy expenditure on the local defence which assumes temporary loss of communications is lessened by the advent of steam propulsion. Against a given force of attack

The days of sailing ships.

Less necessity now for heavy expense on local defence.

* The judgment of the American officers who witnessed the bombardment of the forts at Alexandria was "that vessels are not yet, and never will be, able to fight on even terms with forts." Report on the Operations in Egypt.—*Information from Abroad.* War Series, No. III., p. 74.

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with a given strength of defence there must be a given time for the place to hold out. If we assume a place prepared to hold out for a month when both the news of its investment and the force to relieve it are carried by the wayward, uncertain, and moderate power of the wind, it becomes evident that the same place need not be made capable of sustaining a month's siege if the news of the investment can be carried by telegraph, and the succour can be sent by steam.

Transmission of news.

Assume Gibraltar to be now as it was in 1780, a place with which communications could be intermitted without loss to the Empire, a place therefore which it is intended in the general scheme of defence should be left open to attack by sea. Then supposing no telegraph and no steam, we must assume the investment by the enemy to have been established ten days before the home Government could get news of it; and suppose that when the news arrived the relieving fleet was ready to sail, we must allow a month to elapse before it could make its appearance at Gibraltar.* If then the communications of Gibraltar were not to be kept up, it was strategically necessary that it should be capable of sustaining siege and investment for at least forty days.

If we bring in steam and the telegraph into operation, we have the news of the investment conveyed in a few minutes, and the relieving fleet arriving in four days. If we omit the telegraph on the assumption that the cables are destroyed, we have eight days between the beginning of the investment and the arrival of relief. From this point of view we can say that if it were necessary for the retention of Gibraltar that it should have been prepared to stand a siege of forty days in the time of sailing fleets, it need only be prepared to hold out for eight days, or one-fifth of the time, now that we are in face of steam propulsion.

But when it was necessary to prepare Gibraltar to stand for a certain time alone, and with its communications destroyed, imperial necessities did not demand that they should be kept up. The expenditure of money on Gibraltar as a fortress now depends on whether the old policy can be renewed. In 1779, when we were at war with France and Spain, the whole naval force that we considered necessary to maintain in the Mediterranean amounted to no more than one 60- and one 50-gun ship, four frigates and a brig. There was then no great stream of commerce through the straits of Gibraltar, as to which we had to choose whether to guard it or abandon it. It is probable that no strategist or statesman seriously contemplates now-

Our Mediterranean position in 1779.

* Rodney's relieving fleet left Portmouth on December 26, 1779, and arrived at Gibraltar on January 27, 1780. Darby's fleet sailed on March 13, 1781, and arrived April 12. Howe's fleet left on September 11, 1782, and arrived October 11.

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a-days a scheme of imperial defence which assumes the destruction or diversion of the flow of British trade between the Pillars of Hercules. It is no doubt the fact that from time to time there springs up a certain advocacy of alternative routes to the east. Such advocacy is reasonable if viewed purely as suggesting an outlet in case of failure to preserve the Mediterranean route to the east. But I am not sure that I have met with any proposal to abandon the Mediterranean as a preliminary measure in the defence of the Empire. If there are such proposals, I have not been informed as to how it is intended that Gibraltar and Malta are to be dealt with. In the event of our failing to maintain our communications with the east viâ the Mediterranean and the Canal, we ought to understand that we are either to abandon Malta and Gibraltar, as we abandoned Minorca in 1782, or we must be prepared with very great naval forces for the purpose of relieving these fortresses from time to time, as we relieved Gibraltar in 1780, 1781 and 1782. We are either to give these strong places up, or we are ultimately to defend them by the only means possible, that is by naval means. Without any question the maintenance of our hold on Gibraltar was, in the years mentioned, a hampering of, and not an assistance to, our Navy; while the withdrawal of great fleets from the Channel might have left us peculiarly open to attack at home. It has been noticed by a very competent and observant officer that a connexion between the maintenance of Gibraltar and the loss of our American colonies might be established. Certainly, if Howe in the autumn of 1782 was able to quit the Channel for two months with 34 sail of the line, it would seem to show that but for Gibraltar such a force was available in North America, but it would take me too far from my subject to follow the thought out.* What we have to deal with is the illustration given by the case of Gibraltar: that while it would undoubtedly have fallen with less local defensive power than it had, it would equally have fallen had not the whole available Navy been summoned to its support.

Alternative routes to the east.

Admiral Howe.

In considering the question, we ought not, I think, to suffer our minds to be involved in estimating the value of Gibraltar itself. The whole relations between the systems of defence by local strength, available for a time, but after a time certain to fail, and the system of defence by the maintenance of communications, which is not limited in effectiveness by the element of time, are only equalled in importance by their complication. The practice we have grown into of assuming two funds, one of which is applicable to maintaining

Assumption of two separate funds.

* Howe, leaving Portsmouth on September 11, did not return till November 14. Eight of his ships were detached.

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communications, and the other applicable to separate local defence, founded, as it must be, on the assumption of a failure or interruption of communications, might quite conceivably be pushed to an extent which would weaken the whole Empire. For the fund is originally one found in the hands of the Chancellor of the Exchequer, and he does not go into the relative values of different sorts of defence unless called on to do so in Cabinet Council or Committee of Cabinet. So that, conceivably, if there should be no Committee of Cabinet on the subject, the reduction of estimate called for by the Chancellor might fall wholly on the defence of communications, and not at all on the local defences of territories, which by themselves are nothing, but, considered as part of the communications, everything. And, indeed, according to Lord Randolph Churchill's account, something very like this actually happened just before he quitted office. Bringing equal pressure to bear on the War Department and on the Admiralty, he got the latter to yield up £700,000, which certainly came out of the defence of the communications, while the former only yielded up £150,000, of which possibly none came off the local defences.

Chancellor of the Exchequer.

Lord Randolph Churchill's pressure.

At the bottom of the whole difficult problem—which is chiefly difficult, be it observed, from the fact that the administration of the local defences is independent of the administration of the defence of communications—lies the difference of view which may be held regarding the command of the sea. To those who think, as I myself do, that such a command of the sea as in all our wars with France and Spain we have held in the English Channel, is not very difficult for us to hold now all over the world, local defences will assume one aspect. To those who think that not only in distant parts of the world, but in the seas surrounding these islands themselves, we must look in future wars for conditions such as we dealt with when Rodney and de Grasse faced one another in the West Indies, or Hughes and Suffren contended on pretty equal terms in the East Indies, the aspect of local defences must be entirely different. And I think it must be admitted that the latter view prevails, not only amongst military but amongst naval men. I am conscious myself that in my general thoughts regarding the relative values of the local defences of spots of territory, and the defences of their communications, I rate the latter higher, and the former lower, than most of my contemporaries. I always feel that in this I may be wrong, and yet every re-examination I make, every fresh illustration that I bring before my mind, with the view of balancing it, tends more and more to raise the value of all that keeps up communication by sea, and to

Local defence and the command of the sea.

Rodney and de Grasse.

Hughes and Suffren.

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lower the value of all absolutely fixed local defences. That is to say, I get further and further from the contemplation of a disputed command of the sea, believing that, should we negligently suffer it, we shall be taking, not the first retrograde step, but the final step which will complete our ruin as an Empire, and reduce us to a low place in the scale of nations.

Command of the sea, and its disputed command.

The difference between command of the sea, and disputed command of the sea, is illustrated commonly to my mind by considering France as maintaining her frontiers intact against the German armies, and thereby keeping her territory free and under her control; and France as invaded by German armies, which she sometimes defeats, and sometimes fails to defeat, within her own territory. Supposing in this latter case that her towns were so well locally defended that the invaders could only invest them, as Metz and Paris actually were invested, and yet that the French armies should fail, as they did fail, to drive the invaders over the frontier into their own country, reason teaches us, and experience confirms it, that unless the local defences of the towns should either enable the numbers of the defending armies to be increased, or should increase the fighting power of the numbers otherwise existing, there would be no real strength for France in the locally defended towns.

The frontier of our Empire.

This conception follows close on the other conception—universally, I believe, accepted by the Navy from the moment I put it forward—namely, that the frontier of our Empire is the enemy's coast line. It is a very old conception, and must have been at the bottom of our ancient claim to the sovereignty of the four seas, or of the British seas, as they were indifferently called. But in the absence of Colonial territory, in the absence, in fact, of an Empire, and the existence only of a Kingdom, it did not give the idea that military force which it now possesses.

If we are right in considering that to preserve Empire we must preserve the control of the roads within the Empire, we cannot be right in considering our seaports as frontier towns, and our shores as defensible lines of demarcation between us and foreign forces. The two conceptions lie opposed to one another, and their divergence is certainly as old as the days of Pitt, when he turned upon the Addington Ministry, and selected the Admiralty, with St. Vincent at its head, as the best point of attack. St. Vincent's attitude then was no new one, and it is the general naval attitude now. It is perfectly true that every now and then we hear in naval companies of expressions and concurrences which admit of a less full and hearty acceptation of the policy laid down by St. Vincent in Council, and by

Pitt.

St. Vincent.

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Nelson in Action, than we sometimes expect. But this proceeds in part from feelings of tolerance and good nature towards the sister service, which, truth to tell, were but weak forces in the minds of the two great seamen I have spoken of, and in part from the dormant condition of the critical faculty. Naval officers have accepted pretty generally the term "first line of defence," as applied to the Navy—a term which they never could have invented themselves—because they found it growing into general use, especially amongst military men, and because it seemed to give to the Navy something of the pre-eminently defensive character which they had instinctively felt it to possess ever since they were children. But their critical faculty not being aroused, they did not perceive all the fallacies and incorrect conceptions which lay under the words. Yet I think the words never were good ones, and never could express a true conception. I recollect the late Admiral Sir William King Hall endeavouring to correct it in a speech at a City dinner by declaring that "the Navy was the first line of defence, the second line of defence, and the third line of defence." But though these words might well tend to modify a conception originally erroneous, they were not calculated to remove it. It is impossible to use the expression "a line of defence" without conceiving a defensive chain, liable to be broken through, and with either something defensive or nothing defensive behind it; but such a conception is quite out of place in considering the functions of the British Navy. It is true that in contemplating Lord St. Vincent's naval preparations *for the defence of the British Islands* separately from the rest of the Empire, Sir Edward Pellew spoke of it as a "triple bulwark;" but then he spoke of a naval force really disposed in three lines: a main outer line of the heaviest character watching the enemy, an inner belt of cruisers, and a third body consisting of a concentrated reserve fleet, in case of any partial failure of the first line. But it would hardly have occurred to Sir Edward to include in his lines of defence the squadrons guarding our commerce and possessions in the East and West Indies, or the various ships acting as convoys to our trade in every part of the world.

First line of defence.

Sir W. King Hall.

Lord St. Vincent.

Sir Edward Pellew.

And it is apparent that we can—if the enemy's coast is our frontier—no more speak of the Navy as a "line of defence" than the French nation can speak of their army as a "line of defence" against the Germans; or than the Germans can speak of their army as a "line of defence" against possible enemies, north or south. The British Navy, like the French or German armies on the defensive, must in the first instance guard the frontier and keep their territory—in this case water, and not land—free to lawful passage, and barred to the

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march of enemies. Should they fail to keep the frontier, they must fall back within the water territory, and endeavour to beat the enemies which have invaded it over the frontier again. Should they fail in this—as France failed in the last war—the Empire is conquered, even as the French Empire was, notwithstanding that a sea-girt Metz or a water-surrounded Paris of the British Empire should prove so strong in local defence that investment, and not assault, must be the tactic employed to reduce them.

Analogy.

And the state of a conquered French Empire, throughout which the communications are by land, appears to me strictly analogous to the state of a conquered British Empire, throughout which the communications are by sea. I am unable to see any difference in principle, though there may be difference in the degree of its applicability. The enemy gives the law to the territory in both cases. Fortified towns may hold out all over the land Empire, yet if the armies of the enemy hold the roads between the towns, the towns are bound to fall in due course, and perhaps without attack of any kind. Broadly it may be said, that in all our naval wars this has been the case. Wherever and whenever we have been able to get the sea highways into our hands, the territories which they connect—omitting self-supporting continents, of course—have fallen to us. Wherever we have failed to control the sea roads, we have not only made no conquests of territory, but have lost those territories which we possessed.

We have controlled the Channel since 1667.

Generalising for purposes of illustration, we must say that, without exception, we have controlled the English Channel, considered as a road to the heart of the Empire, ever since the days of De Ruyter, in 1667. In that year the Dutch had a full command of the Channel, for Charles, listening to the economists, who had behind them the telling claim that his father had lost his head for refusing to be guided by them, had destroyed his naval force. It is illustrative of what has already been advanced as the principle of defence by fixed works, that Portsmouth was on this occasion considered too well locally defended to be attacked; and it would be easy to quote the case to justify a heavy expenditure, and a great reliance on such works. But he would be a strange advocate who could soberly recommend expenditure which would encourage a return to Charles' disastrous policy. The works of Portsmouth could only have been brought into play when the game was so far given up that the Dutch were free to hold the mouth of the Thames, and therefore to invade at their leisure.

But since that day we have never lost the control of the Channel,

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though we once had to fight for it on the spot; and once we mistakenly fought for it when fighting was imprudent, and a beating might have lost it to us. It is not that hostile fleets have not appeared in the Channel, but it is that, with the exceptions named, such hostile fleets as appeared never felt themselves strong enough to fight for the command of the water, and as a consequence were never able to attempt territorial attacks.

Early contests for supremacy.

In 1690 the French fleet appeared in the easternmost part of the Channel in such strength that Lord Torrington would never of his own motion have attacked them, and yet was in his own mind quite easy as to the situation. "We were forced to fight," he said, "contrary to the opinion of the whole council of war." Thus wrote the Admiral to Lord Nottingham, when off the Isle of Wight, on the 26th June: "We have now a pretty good view of their" (the French) "fleet, which consists of near, if not quite, eighty men-of-war, fit to lie in a line, and thirty fire-ships; a strength that puts me beside the hopes of success, if we should fight, and really may not only endanger the losing of the fleet, but at least the quiet of our own country too; *for if we are beaten, they, being absolutely masters of the sea, will be at great liberty of doing many things they dare not attempt whilst we observe them, and are in a possibility of finding Vice-Admiral Killigrew and our ships to the westward.*"*

Queen Mary's Council, overriding the judgment of the naval men, ordered Torrington to fight, and there ensued the partial engagement of Beachy Head, made partial, and kept partial specially by the Admiral, in order to avoid the complete defeat which the superiority of the enemy rendered certain, and simply to prevent him getting that undisputed command of the Channel which might have been fatal to William III.

The naval history of the next year is a perfect example of the whole policy of naval defence. The French were ready to invade us, so soon as they had the necessary command of the Channel. England was aware that if the command of the Channel was wrested from her,

Tourville.

invasion would follow. Tourville, at the head of an immense naval force, sailed up the Channel to cover the crossing of a French army, which had orders to embark as soon as he appeared. Russell was, however, strong enough to offer battle to this covering fleet, and the

La Hogue.

great fight of La Hogue gave to the English again their undisputed command of the Channel, and stopped all idea of invasion from that moment. The only other serious appearance of the enemy in the Channel was in 1779, when an enormous Franco-Spanish fleet

* *Entinck's Naval History*, p. 584.

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appeared off Plymouth, and yet was entirely held in check by the neighbourhood of a much inferior fleet under Sir Charles Hardy. I can hardly look on the proposed invasion of 1744 from Dunkirk, and the arrival of De Roquefeuille's covering fleet at Dungeness as a really serious attempt, for his French fleet was not originally strong enough to fight for the command of the Channel, and precipitately fled on first sight of the English fleet under Sir John Norris.

Sir Charles Hardy.

Sir John Norris.

The projected invasion of 1759 was not at all unlike that of 1805, and in both cases the intended covering fleets were beaten to pieces. In the first case by Hawke and Boscawen, before they could even think of the Channel, suffering in fact the fate of Villeneuve at the hands of Calder.

Hawke.

Boscawen.

This command of the Channel by our fleet is then a supreme element in the defence of the Empire, as Sir John Colomb has placed it. It cannot be omitted, argued away, or spoken of as doubtful, in any possible scheme which is founded on reason. "No bulwarks, no towers along the steep" can be substituted for it. They do not touch the fringe of the position. If it be argued that while the fleets of Torrington, Russell, Norris, Hawke, Boscawen, Calder, Nelson, and Cornwallis, were always able to prevent every territorial attack of consequence, so were the defences of Portsmouth able to prevent De Ruyter from attacking when he had command of the Channel, the answer seems that to be these latter would neither have prevented invasion nor even attack on themselves had the Dutch been prepared for serious business. Not being so prepared, few games they could play were worth the candle, and the slightest of local defences were sufficient to prevent an attack which could not be serious, and was in the nature of a raid only. But if the command of the Channel was the only reliable defence of the kingdom when it was self-supporting and there was no Empire, how much more absolute is the necessity when there is no self-support, and there is an Empire with water roads? If we contemplate the loss of the Channel now, we contemplate imperial ruin as a certain thing, and the conquest of these islands by investment as but a part of the ruin.

Importance of retaining command of the Channel.

And then every spot of territory we possess which is not self-supporting, is only a smaller edition of the defensible status of the British Islands. If we contemplate our communications by sea with it being cut off, we contemplate its certain fall. We cannot, in short, admit such a contingency as Gibraltar, Malta, Bermuda, Hong Kong, Aden, or Singapore, being cut off from the rest of the Empire and obliged to defend themselves when surrounded by the enemy. We contemplate their certain fall when we do this. We accept a return

Necessary result of our communications with the Colonies being cut off.

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to the conditions I have spoken of as existing in the East and West Indies at one time, and as existing in the Mediterranean when we allowed Gibraltar to be bombarded, Minorca to fall twice, and Corsica and Elba to pass out of our hands.

This sort of condition was all very well when at the end of each year we were able to balance accounts with the enemy in the matter of ships and territories captured on each nation. There was nothing vital about it, and no ruin involved on either side. It was all an affair of pawns, very interesting and exciting as ultimately preparing for the check-mate which might be given by the gainer, but which was not, because of the fulness of the chapter of accidents, at all a certainty. Now these changes in the possession of territories mean not only losses to the Empire which holds them, but stoppage of circulation and paralysis in the limbs of a delicate and extremely sensitive imperial body.

Naval war with sailing ships.

Nothing was certain, nothing absolute, in sailing naval war. In steam war all is absolute and certain; time, supply, and force, if care is taken in the comparison. If coal were now as easily procured as water was then; and if the taking of water then meant that some one else was deprived of it, as is the case with coal now; we might be better able to afford a disputed command of the sea in the vinicity of our ports of supply. Being as we are, dependent generally on coal that has to be carried across the sea, we must not only guard it in store, but when proceeding to store. Rightly as we may and do regard the defence of the store as an all important matter, we must not forget that it is no use defending an empty store. And this we should be constantly doing if we guarded the place of deposit and then left it. In the days of disputed command of the sea of which I am speaking, our water could be picked up in most places, our victuallers and store ships were only required at long intervals, and the interception of them by the enemy had none of the certainties of time and place which now surround their possible capture. Let us look for a moment at what happens when disputed command of the sea is allowed. When Rodney got to Barbadoes in February, 1780, he found De Guichen blockading a British squadron in St. Lucia, and preparing to attack the island. Rodney's appearance sufficed to relieve it. Then followed an indecisive battle, and the British destroyed Fort St. Juan. Later, Rodney, reinforced, took St. Eustatia, Demerara and Essequibo. Then the French were reinforced and British territorial attacks had to be given up. There was another indecisive fleet action, and the French renewed their attempts on St. Lucia, captured Tobago, St. Kitts, Nevis, Montserrat, and recaptured St. Eustatia, Demerara,

Admiral Rodney.

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and Essequibo, so that the British were left in possession of only Barbadoes, Jamaica, St. Lucia, and Antigua. But all this interchange of possession ceased after Rodney's action, which gave to the British the undisputed command of the sea.

Hughes and Suffren.

So in the East Indies. The five battles between Hughes and Suffren were sufficient indication that neither was master, and accordingly each, as opportunity offered for a local command due to the wind, made such territorial attacks as time admitted. Hughes co-operated with the army in attacks on Negapatam and Chinsura, and possessed himself of the fortress of Trincomalee. Suffren, watching his chance, captured Cuddalore, and re-took Trincomalee, which he held till the peace.

Always the same tale.

Thus we see always the same tale. If communications cannot be cut territories cannot be attacked. If communications are cut and attacks made, territories will always fall if communications are not restored in time. Wherever it is necessary for us to keep up communications, we secure the place by the act. If we abandon the idea of uninterrupted communications, then we embrace the idea of the certain fall of our territories. If we embrace the idea of uninterrupted communications, we dispense with that of assuming the necessity for very great local strength, and fall back on the immediate defence of our stored supplies, which need not embrace the defence of the surrounding localities, because our assumption is that surrounding localities cannot be attacked while our communications are complete.

We must not leave very important posts liable to capture by very inferior forces acting suddenly and by surprise. But we are not to suppose that any spot of our territory can hold out by itself with its sea communications cut. We shall probably go fatally wrong if we suppose that there is any real substitute for purely naval defence, or that local fixed defences will free us from the absolute necessity of providing for the security of ingress to, and egress from, all our ports, whether fortified or not; and whether they be naval bases such as Portsmouth, Plymouth, Malta, Simon's Bay, Hong Kong, Bermuda, Halifax, and Port Royal; commercial ports such as Liverpool, Newcastle, Cape Town, Durban, Bombay, Colombo, Calcutta, Melbourne, Sydney, or Brisbane; or ports of commercial call such as Gibraltar, Port Said, Suez, Aden, Singapore, or Albany.

No real substitute for purely naval defence.

Conclusion.

So long as we clearly understand that our fixed local defences are subordinate to, and assistant to, maintained lines of communication, and that purely naval force is never to be absent long enough to allow communication to be cut, we shall not allow much waste of

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money on what is not of the essence of imperial defence. But if we suppose that local fixed defences will relieve the Navy of any part of its historically defensive character, and assume that fixed defences are a real substitute for naval defence, and will either strengthen the Navy for purely offensive warfare, or enable us to maintain a less complete fleet, then it should seem that we are not reading at all, or not reading aright, the teachings of naval history.

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CHAPTER II.

Resources available for Manning the Fleet.

In examining our position as a maritime power, the resources at our command for the manning of the fleet should be the first subject to be considered. The Estimates, in their revised form, convey all the information required. The latest figures were given in Admiral Colomb's able paper on the naval mobilization of 1888.

Turning to this document, we find the personnel of the Navy proper, including marines, thus distributed :—

In ships on active service	23,190
In First Reserve ships and tenders	3,385
Surveying ships	698
Troop and store ships	2,166
Total in seagoing ships	29,439
In gunnery and training ships	2,584
In stationary ships	4,193
In drill ships	269
In reserves and under training	14,560
Total in harbour ships	21,606
Total for the Service afloat	51,045
Officers on half-pay	341
Royal Marines on shore in reserve	6,367
Coast Guard Reserve	4,000
Royal Naval Reserve	19,828
Pensioner Reserve*	2,210
Royal Naval Artillery Volunteers	2,000
Total in reserve	34,746

The number of men required must be measured by the number of our ships. For the 103 seagoing vessels in commission, and for the first-reserve squadron of 16 ships, the complements, with the assistance of the Coast Guard, are fully provided. In reserve,

The number of our ships must be the measure of the number of our men.

* Behind these are the pensioners under 55 years of age, but the numbers are not given.

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Number of ships. Admiral Colomb gives our strength at 58 seagoing, and 39 coast-defence ships, with a flotilla of 80 torpedo-boats of the first class. The large force of 21,606 men in the harbour ships is sufficient to **Number of men.** man effectively all the available vessels in reserve. For the further requirements, for the manning of auxiliary cruisers and for harbour and coast-defence duties, we have 34,746 men in the reserves.

Admiral Colomb concludes from this review of the position that "there does seem to be *prima facie* evidence that, for the first time almost in our history, we have got, at not immoderate cost, a very ample supply of men in proportion to our ships."

Numbers of men voted. The numbers voted by parliament for the naval service have been rapidly growing. Officers and men have been increased from 34,695 in 1874–75 to 40,351 in 1888–89. Of these 4000 were required to provide increased engine-room complements, and 1000 for the torpedo service.

A further increase is shown in the Estimates for 1889–90. The number of all ranks compare as follows :—

	1889–90	1888–89
For Her Majesty's fleet	41,730	39,557
Boys	4,514	5,089
	46,244	44,646
Coast Guard	4,200	4,000
Royal Marines	13,874	12,766
Borne for various services	1,082	988
	65,400	62,400
Officers on salary	90	112
Royal Naval Reserve Officers	418	328
„ „ „ Men	19,700	19,500
Seamen and Marine Pensioners Reserve	2,210	2,210
Royal Naval Artillery Volunteers (efficient)	2,000	2,000
	89,818	86,550

Insufficiency of lieutenants and engineers for war. While our resources for manning the Navy are on the whole satisfactory, in the commissioned ranks the list of lieutenants and engineers is insufficient to meet the emergency of war. Considerations both of cost and efficiency make it undesirable to increase the lists in time of peace. The first demands of a naval conflict would be promptly and adequately met by a large promotion of sub-lieutenants, the vacancies in the junior ranks being filled by the employment of warrant officers. In a prolonged struggle it would be necessary to turn to those resources, both of officers and men,

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which can be created in the mercantile marine, and the value of which is not sufficiently appreciated in time of peace.

The authorised strength for the officers of the Royal Naval Reserve is as follows: **Strength of the Naval Reserve officers.**

150 Lieutenants
270 Sub-Lieutenants
150 Engineers
150 Assistant Engineers
200 Midshipmen.

The actual strength, as stated by Sir Anthony Hoskins, is

50 Lieutenants
120 Sub-Lieutenants
155 Midshipmen
3 Engineers

in all 328

There should be no difficulty in augmenting these numbers to any required standard by enrolments from the mercantile marine.

Steps have been recently taken to increase the efficiency of the officers of the Reserve. They have been invited to volunteer for temporary service in an exercising squadron, for courses of instruction in gunnery and torpedo, or for service with the fleet for a period of twelve months. At the expiration of the twelve months' training they will, if they have given satisfaction, receive annual fees, Lieutenants at the rate of £25, and sub-lieutenants at the rate of £20. Officers of the Reserve have begun to avail themselves of the opportunities now for the first time offered of receiving an effective training. Those who have volunteered have been found highly satisfactory. It is desirable that the Admiral Superintendent of the Reserves should be advised as to the appointment of officers to the Naval Reserve by the local marine boards, or by a general committee representing the shipowners of the United Kingdom. **Inducements held out.**

It has been proposed, as a further means of increasing the Reserve, that the Admiralty should require that specially subsidised steamships should be largely officered by reserve officers who have passed through a twelvemonth's service on a man-of-war, that the ships should be manned by seamen of the reserve, and that the armaments of the ships should be carried on board, one or more guns being mounted in position, and the men drilled at suitable opportunities. **Additional means.**

The deficiency of engineers should not be suffered to continue.

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Views in regard to engineers.

With the co-operation of a committee of shipowners no difficulty can be experienced in keeping up the list of efficient engineers of the Royal Naval Reserve to any required standard. There should be no hesitation on the part of Parliament to meet the expenditure which may be required. It is far cheaper to provide for the manning of the Navy by means of a Reserve than by adding to the permanent force. From the point of view of efficiency it is certain that engineers in constant practice will be more efficient than officers who are only occasionally employed in the management of powerful machinery at sea.

Remedy for the deficiency of stokers.

Whenever a large number of vessels are put in commission the deficiency of efficient stokers has been much felt. The remedy is to be found in the enrolment of an adequate reserve. For the annual mobilization of the fleet men should be brought in from the reserves. The advantages already urged of reliance on men of the reserve in constant practice, rather than on a larger permanent force not sufficiently exercised, apply with even greater force to the stokers than to the officers under whom they serve.

Lieut. Colwell's paper on Naval Reserves.

The suggestion that we should look to the mercantile marine to supply engineers and stokers to the Navy in a time of pressure, brings up for consideration the general question of the Naval Reserves. An excellent paper on this subject, by Lieutenant Colwell, U. S. N., has recently been published by the United States Government. It will be found in the *General Information Series.*

Sea Fencibles.

The writer opens with a short historical sketch. A reserve was first raised by the Admiralty in 1798, under the designation of Sea Fencibles. In 1810 the force numbered 23,455 men. It was disbanded at the close of the great war.

Dockyard battalions.

In 1847 the Admiralty again made an effort to raise a force for home defence. With this view three dockyard battalions were organised. They were recruited from the men employed in those establishments. The maximum strength was 9000. The dockyard battalions disappeared after a shadowy existence of some twenty years.

Royal Naval Coast Volunteers.

In 1853 an Act was passed giving authority to the Admiralty to raise the Royal Naval Coast Volunteers. In 1859 the force reached a strength of 6869 men, but like the preceding organizations it was doomed to an early dissolution.

Naval Reserve.

The present Royal Naval Reserve was established on the recommendation of the Royal Commission appointed in 1858 to examine the whole question of the manning of the Navy. The presidency

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of the Commission was entrusted to Lord Cardwell, whose able report supplied the ground-work for the plans subsequently matured at the Admiralty. The authorized strength of the Royal Naval Reserve is 920 officers and 30,000 men. The active force actually enrolled is 264 officers and 18,000 men.

Lieutenant Colwell states at length the regulations in force for the enrolment of officers and seamen. It will not be necessary to give details readily obtainable by English readers. It will be more important to reproduce the criticisms of a competent observer.

Lieutenant Colwell's criticisms on our Naval Reserve.

"The details of the organization of the Royal Naval Reserve have been given, since it is the corps which is brought most prominently to our notice in considering the question of establishing a reserve for our own Navy. Its weaknesses are apparent, and although it has existed for nearly thirty years, it can scarcely be regarded as a favourable showing that its actual strength but slightly exceeds one-half the authorised number of men and falls short of one-third the authorised number of officers, after the expenditure of so much labour and money and a lapse of so long a time since its conception. Great efforts have been made to popularise the service, the accruing benefits have been extended and increased, and committees have been convened at various times to inquire into the working of the system and devise means for its improvement; but all with the maximum results that are far from satisfactory. The material of which it is composed is admirable, but the system is open to the objections that these men, if drafted on board a modern man-of-war, would be nearly as useless as any other untrained men. Their qualifications as able seamen would find no scope, for the modern fighting ship is mastless, and requires, in addition to the engine-room force, only the men to direct the ship and operate the gun, torpedo, and electric armament. Their training would be found to be of little value, for they have no permanent organization, no permanent officers whom they know and to whom they are accustomed, no uniform system of instruction has been given them, and the weapons with which they have been in the habit of going through their annual drill are obsolete and no longer find a place on war ships. The short periods of training with strange comrades, strange officers, varied weapons, and unfamiliar surroundings, owing to their constantly changing the place at which they take their drill, cannot possibly give them the discipline and systematic way of performing their duties so necessary to the fighting efficiency of that complicated machine—the war-ship of the present day. The full strength of the corps can never be available on short notice, for it is much scattered, not only over the United Kingdom, but over

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the face of the world, and it would be a liberal estimate to state that within a fortnight after being called out not more than one-third the enrolled strength, or six thousand men, could present themselves at the rendezvous, and these might find themselves drafted to a class of vessel with which they were totally unfamiliar, and stationed at a type of gun they had never seen."

Having seen what are the defects of the Naval Reserve, as they appear to a competent and disinterested observer, let us consider the remedies.

Suggested remedies for defects in present system.

Some suggestive papers have recently been read at the Royal United Service Institution by Lieutenant Crutchley of the Royal Naval Reserve, and Lieutenant Caborne of the U. S. N. The writers insist on the necessity of instruction in the torpedo, and drill at quick-firing guns; on the waste of time and the lack of zeal caused by drilling at obsolete weapons; and on the desirability of giving encouragement to zeal and conduct by authorizing the establishment of petty officers' ratings.

When all that is practicable has been done, it must be admitted that the Naval Reserve will fall far behind the regular Navy in efficiency for duty in ironclads or in the torpedo flotilla. The appropriate sphere of the naval reserve will be found in the auxiliary cruisers which it would certainly be necessary to take into the service from the mercantile marine in case of war.

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CHAPTER III.

Royal Naval Artillery Volunteers, and Home Defence.

Having given reasons why no attempt should be made to raise a force in the United States corresponding to our Naval Reserve, Lieut. Colwell proceeds to report on the organization of the Royal Naval Artillery Volunteers. He opens with observations on the great changes which are taking place in the Naval Service.

Lieutenant Colwell on Royal Naval Artillery Volunteers.

"The seaman, in the limited sense in which we have been accustomed to use that term, no longer occupies the prominent place on the modern war-ship. He was necessary, in his day, to skilfully control the motive power of his ship, but that day has gone, and the naval seaman of the present day must be a man of more varied accomplishments and higher ability to receive the special instruction which has become so necessary for the efficient and intelligent manipulation of the weapons which are placed in his hands. There need be no fear that the 'ready resource' and 'nerve' of the seaman will not receive as much cultivation in the varied exercises for battle in the modern warship as they ever did in a gale of wind, aloft, in the sailing ships of the past.

"A realisation of this truth has led to the establishment and encouragement by the British Government of the force known as the Royal Naval Artillery Volunteers. Situated as we are, a development of a similar corps appears to present an efficient force with an organization nearly suited to our needs."

Congress Bill for Naval Militia.

Practical action has recently been taken by the naval department of the United States. Secretary Whithouse has carried through Congress a Bill, of which the main provisions are given in the *Army and Navy Journal* of New York. "The bill provides for the enrolment into a Naval Militia of seafaring men, ship and yacht owners and employés, members of yacht clubs, and ex-officers and enlisted men of the Navy. Out of these are to be organized artillery and torpedo corps, to whom the Secretary shall be authorized to furnish arms and equipments and naval vessels for instruction and drill, the State authorities to commission officers who may also be commissioned,

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after an examination as to competency, by the President in the same titles and grades, to be paid only when called into service for war or training purposes. Those of the Naval Militia who so elect may be enrolled for a period not exceeding five years into a Naval Reserve for navigating duties, subject to call for duty, when the danger of war is imminent, under the penalties of desertion if they neglect to respond. This enrolment shall include the Life Saving and Lighthouse services, the Revenue Marine and the coast signal service. Thirty days' training in each year is required, petty officers found fit for duty to receive for this period thirty, and each man of inferior rating twenty dollars. All available steam vessels properly constructed are also to be enrolled for service in case of need, and their owners are to receive a sum not exceeding eight per centum yearly upon their value as determined by the Navy Department. The amount of compensation is to vary according to the character of the vessel, the maximum to be allowed to vessels showing 19 knots or more. Officers of the Naval Reserve are to be borne upon the Navy Register, and a flag or pennant with the letters U. S. N. R. is prescribed for the reserves. Naval officers are to be furnished for any school ships to be established by State authorities. A million dollars is appropriated for carrying out the measure."

Life Saving and Lighthouse services, &c.

Vessels also enrolled.

Naval officers allowed for school ships.

The action taken by the Government is being supplemented by the patriotic efforts of the American yachtsmen. We again borrow from the *Army and Navy Journal*. In its issue of the 4th of February, 1888, it is reported that:—

Patriotic efforts.

"The managers of the New York Navigation School have decided to organize a summer cruise for the training of yachtsmen. A 300-ton barque will be chartered and placed under the command of Capt. Howard Patterson, assisted by several officers, two of whom are ex-officers of the Navy. She will be fitted throughout, as far as possible, like a man-of-war, and subjected as far as practicable to the discipline of the Naval Service.

Ship to be chartered for instruction.

"Regular school hours will be arranged for, with lessons in marlinspike, seamanship, bending, making, shortening, and furling sail, steering, heaving the lead, tacking and wearing ship, hoisting or striking yards, &c. There will also be instruction in chart sailing, dead reckoning, and finding the ship's position by solar, lunar and stellar observations; gunnery, small arm and broad-sword exercise, clearing ship for action, fire, quarters, abandoning ship, torpedo service, boat service and target practice; signalling by the International Code, and by the 'distance' and semaphoric systems.

Subjects taught.

"The general idea is to thoroughly prepare the cadets for passing a

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successful examination before the Naval Board, and thus entitle them to a Naval Reserve commission.

"It is proposed that the training ship shall leave New York early in June and cruise through Long Island Sound, touching at the various harbours along its coast, so as to give yachtsmen an opportunity to join or leave the ship, according to their business and family arrangements. Should sufficient encouragement be offered, an off-shore cruise to Bermuda or some other foreign port will follow." Proposed programme.

In England, Mr. Seth Smith has made a spirited attempt to give a practical training to the Royal Naval Artillery Volunteers, similar to that which has been organised in New York. Mr. Seth Smith has accomplished a voyage to the Azores and back in a schooner entirely manned and commanded by Naval Volunteers. A patriotic individual having given the lead, his example should be followed by combined effort. It is only by combination that a steady and sustained system can be established. England, Mr. Seth Smith.

The Naval Volunteer movement in this country has not been developed with the vigour which had been anticipated by those eager spirits by whom it was initiated. The Admiralty have been doubtful as to the practicability of obtaining efficient service for the Navy from a force not recruited from the sea-faring population. No definite plan has as yet been assigned to the Volunteers in the general scheme of naval defence. Admiralty views.

It was an original error to have organized the Volunteers as blue-jackets. It was a concession to pardonable vanity at a time when the Admiralty was prepared to do anything for the Volunteers rather than spend money, whether on capitation grants or otherwise. Organised as a force of Marine Artillery, the Volunteers would have occupied an appropriate place. Their officers would have had adequate rank. What is far more important, there would have been no difficulty in assigning to the force a sphere of duty afloat in which they would have been able to render good service to the country. It is not too late to make a change on every ground most earnestly to be recommended. Not too late to alter.

While admitting that an error was committed in the origin, it is certain that a force specially organized for the defence of the harbours and the home trade would be a valuable auxiliary to the Navy. A complete scheme of naval defence must be such as was described by Sir Edward Pellew to the House of Commons in a passage quoted by Admiral Colomb.

"I see," said he, "a triple naval bulwark, composed of one fleet acting on the enemy's coast; of another, consisting of heavier ships, Sir Edward Pellew's views.

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stationed in the Downs, ready to act at a moment's notice; and a third, close to the beach, capable of destroying any portion of the enemy's flotilla that might escape the vigilance of the other two."

The third line of defence.

The sphere of the Naval Volunteers is in the third line of defence, guarding and watching the coasts, and the entrance to ports. Of the value of the property which might be exposed to capture within these narrow limits some conception may be formed from the fact mentioned by Admiral Colomb that 620,000 or 630,000 British ships enter or leave our home ports every year—1800 or 1900 a day—clustering like bees off all our great estuaries, the Thames, the Humber, the Tyne, the Clyde, the Mersey, the Severn. On the average, a ship passes Beachy Head every five minutes.

Ships entering or leaving our home ports daily.

Number of British ships captured by privateers, 1793-1815.

The damage which might be done to a trade of such value may be appreciated from the experiences of the past. In the period from 1793 to 1815, brilliant as were the victories which we gained over our enemies at sea, no less than 10,871 British merchantmen were captured by privateers. It is certain that in the future, as in the past, the efforts of an enemy would be directed mainly against our commerce. To meet these in-shore attacks an effective local defence force should be organised. It is in connection with this force that the Naval Volunteers may hope to fit themselves to do useful service.

Volunteer Home Defence Association scheme.

The Volunteer Home Defence Association have proposed, as their plan for local defence, "That in every considerable seaport of the United Kingdom suitable vessels, more or less numerous, according to the importance of the port, should be fitted to carry quick-firing guns; that a local force of Naval Volunteers should be attached to those vessels, and trained to arm, equip, man, and fight them; and that the guns, ammunition, and other articles required for service should be placed in store on the spot in readiness for use in time of war."

Approved by the Admiralty.

The scheme received the approval of the Admiralty, who sanctioned the enrolment of a brigade of Royal Naval Artillery Volunteers, subject to the following conditions.

"A vessel or vessels suitable for the purposes of the brigade to be provided at the expense of the local volunteer defence committee. The necessary guns to be supplied by the Admiralty, and a certain amount of ammunition to be provided free of charge, together with the services of an instructor. All gun fittings, magazines, &c., to be provided locally at the expense of the local committee, and also the necessary crew or crews."

The action taken by the Home Defence Association had a valuable

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effect in stirring up the Government to make those enquiries into local resources which are the necessary prelude to practical action. The Inspector-General of Fortifications, Sir Lothian Nicholson, and the present second Sea-Lord, Sir Vesey Hamilton, were sent round to the commercial ports under instructions to confer with the authorities and the leading inhabitants as to the support which might be expected from the local forces and the local efforts. At the instance of the Admiralty, Committees were appointed on the Clyde, the Forth, the Mersey, the Tyne, and the Tees, to consider and report on the proposals for defence which had been placed before them by the gallant officers at the local conferences which they had attended. The result of their deliberation was placed before the Government in the following memorial, addressed to the Prime Minister.

Sir Lothian Nicholson and Sir Vesey Hamilton.

Local Committees.

"January 4, 1889.

"My Lord Marquis,—

"1. You are aware that in the summer of 1888 certain proposals were made by the Government to the inhabitants of five of the principal ports in the North for the defence of their coasts and commerce.

Their memorial.

"2. Those proposals were made by Admiral Sir Vesey Hamilton, as representing the Lords of the Admiralty, and General Sir Lothian Nicholson, as the representative of the War Office; and the five ports selected were the Clyde, the Forth, the Mersey, the Tees, and the Tyne.

"3. Committees were formed at all the ports, who went thoroughly into the matter, with the result that they have all arrived at practical unanimity in their conclusions, and we, the undersigned, who have the honour of your lordship's attention this day, are representative men from each of the five committees in question.

"4. Our opinions have received the assent and support of the highly influential local Press in the several localities, of all shades of political opinion. We therefore feel that we practically represent the interests of all classes in the north of England and in Scotland, and probably of the whole country.

"5. The conclusions referred to are as follows:—

"(*a*) That the need for defence of our commerce and ports is urgent, and should be dealt with without delay.

Conclusions.

"(*b*) That no proposals for defensive measures will be satisfactory unless they are effective and adequate.

"(*c*) That the five ports decline absolutely to accept any responsibility for the initiation, organization, or maintenance of that defence, beyond expressing their readiness to do their best to provide the

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men required as Volunteers, and to co-operate by placing at the disposal of the Government any local knowledge they possess.

"(*d*) That as it is of the essence of military science that the responsibility for adequate organization for war must be centralized, and cannot be distributed without confusion and danger and great loss of efficiency, they hold most strongly that the responsibility for the necessary measures must rest with the Government, and cannot be devolved, even in part, on the localities without disastrous results. They therefore consider it to be beyond their province to prescribe what is necessary and suitable for the defence of each particular locality, although fully alive to the danger in which they at present lie, and desirous to co-operate with the Government, as already indicated.

"(*e*) They are strongly convinced that to reach a real solution of this great question the initiation of the necessary scheme of defence can only properly be put forth by the two departments of the Government concerned, viz., the War Office and the Admiralty; that the necessary organization must equally proceed from and be maintained by those departments; and that the cost of it, including the payments, which may be unavoidable, to the Volunteers, must be borne by the departments.

"(*f*) That with a deep sense of the danger to which our commerce and great mercantile ports are exposed through the present entirely inadequate nature of the defences, they call upon the Government and the departments concerned to lose no time in devising and promulgating a comprehensive scheme to guarantee the security of our ports, and restore that feeling of confidence which has lately been so seriously shaken, and which is the essential foundation of commercial enterprise and prosperity.

"We have the honour to be, my Lord Marquis, your Lordship's obedient servants—

"ARMSTRONG (Tyne).
"J. W. CAMERON (Tees), Lt.-Col., 4th Durham Art. Vol.
"JAS. CURRIE (Forth).
"ROBERT GLADSTONE (Mersey).
"DONALD MATHESON (Clyde), Colonel, 1st Lanark Eng. Vol.
"F. E. B. LORAINE, Lt.-Col. late R.A., Hon. Sec. to Deputation."

Lord Salisbury.

The Committee were subsequently received by Lord Salisbury, who pointed out, in answer to their representation, that it would be difficult for the Government to make full provision at all points, and at the same time for the defence of the empire. The circum-

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stances of the time called for patriotic effort. The Prime Minister appealed to the ports to help the Government to accelerate the completion of the defences. No further action has been taken. It may, however, be assumed that nothing will be done by private effort to provide the material of naval defence without assistance from the Government. The ports will look to the Government not only to provide armaments, but to pay for the hire of local vessels when they may be required for the purposes of drill and exercise.

Numbers required.

For the personnel of local naval defence we have the assurance of those appointed to speak on behalf of the ports that we may place reliance on the patriotic feeling which has given such a noble body of volunteer auxiliaries to the land forces. The ports have promised to raise volunteers for coast defence. Under proper guarantees for efficiency, an increase of the number of Naval Artillery Volunteers to a strength of not less than 5000 would be a most valuable addition to our resources for home defence. To secure efficiency, the conditions of enrolment should be such as to exclude mere landsmen from the force. An effective system of instruction should be provided. It would be more useful to the volunteers to go through a short course in gunnery or the torpedo at Portsmouth than to cruise in the Channel in an obsolete gun-boat. An armoured coast-defence vessel of the Gorgon class should be stationed at each of the great ports as a nucleus of the local force for defence afloat. The presence of such a vessel would afford the best means of drilling the Naval Reserve and Volunteers.

Instruction of volunteers.

Naval volunteers for local defence of coaling-stations.

The volunteer movement should be generously encouraged as a means of supplementing the permanent garrisons at our coaling-stations abroad. We can never maintain the British garrisons in those dependencies at the full strength which would be required in war. When the real strain comes, every Englishman who can do service has a value far beyond what exists in his physical powers in keeping up the *morale* of the native auxiliaries. Already the Naval Volunteer movement has reached as far as to Calcutta and Hong Kong. Sir Vesey Hamilton, in responding to an address presented to him on relinquishing the China command, by a number of the most influential members of the community at Hong Kong, spoke words of encouragement to the Volunteers, which apply with equal force to every dependency of the British Crown.

Naval volunteers in Calcutta and Hong Kong.

"It must always be remembered that the best defence of commerce is a vigorous offensive, and that can only be effected by leaving your defence to our brethren of the Army. I hope soon to hear of your new guns being out, and that the Naval Commander-in-Chief

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will not have to think about the defences of the port, but will be unfettered in discharging his proper function. I would suggest organising your magnificent fleet of steam-launches as a Naval Auxiliary Corps. Under proper guidance, I feel sure that the zeal, ability, and intelligence of the younger members of your community will soon make up for any want of experience, judging from the only opportunity I have had of reviewing a portion of your Naval Volunteers. When members of a community may have to unite against a common foe, knowing one another well is a great help; we know whom to trust and how to trust them."

Steam-launches.

What the recent manœuvres have shown.

The recent manœuvres have shown the utility of an efficient coast-guard. With proper instructions in signalling, the duty of watching the coast would be efficiently carried out in time of war by retired naval officers, pensioners, and naval volunteers. The patriotic proposals of the Home Defence Association should be taken up seriously by the Government.

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CHAPTER IV.

German, French, and English Systems of Coast Defence.

Reprinted from the Report of Lieutenant Colwell, U. S. N.

Germany.

"In considering the question of coast defence for the German Empire, a military commission was appointed to investigate the subject and to report, from a military standpoint, upon the advisability of transferring the entire system to the single control of the navy. The report of this commission was emphatic in favouring such transfer. During the past year, in accordance with its recommendations, all the sea-coast defences, including the formidable fortifications at Kiel, Wilhelmshaven, and the mouths of the Elbe and Weser, have been transferred from the army to the navy.

"The reasons given for recommending the transfer are conclusive and sound in principle. They were—

"(1) The guns and carriages of sea-coast fortifications are similar to those of the navy.

"(2) As coast defence is chiefly against attacks from ships and naval landing parties, naval officers would more readily appreciate the points of weakness of attacking ships, and the object of manœuvres by the movements of the ships; and would recognize the probable designs of the enemy from the preparations.

"(3) As coast defences are to a large extent made up of turrets moved by steam or hydraulic power, a class of men becomes necessary for the manipulation of the machinery which exists in the navy, but not in the army.

"(4) Men accustomed to nautical pursuits are better adapted to care for works situated in the mouths of rivers than men without such familiarity would be. They would also co-operate with the submarine defences more advantageously.

"Complete unity of control is thus established, since the mobile torpedo defence and the submarine defences of all descriptions are already in the hands of the navy.

"The garrisons of the forts are drawn from the Naval Artillery Divisions, and the personnel of the torpedo defences, mobile and

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fixed, form the Torpedo Division. The defence is localized by assigning all the available torpedo-boats and torpedo material to the districts of the coast, each district having its torpedo depôt, and by providing in the scheme of mobilization that men and officers of the reserves shall proceed at once to a fort or depôt within the district in which they reside.

France. "To a limited extent the same system is followed in France. Each military port is commanded by a naval officer of high rank, who has command of all the forces afloat and on shore within the limits of his district. The sea-coast forts are all garrisoned by the Marine Artillery and Infantry, and the personnel for manipulating and caring for the torpedo boats, torpedoes, submarine mines, torpedo store ships, and electric lights is drawn from the navy. Divisions of torpedo boats are permanently assigned to each of the military ports; twenty being at Cherbourg, fifteen at Brest, ten at L'Orient, ten at Rochefort, and twenty at Toulon.

"It is also intended to have stationed at each of the chief ports of the country, other than military ports, six torpedo boats, and at each of the lesser ports, two torpedo boats. For the torpedo boats destined in time of war to act with the coast defence squadrons there are to be established eight harbours of refuge, at each of which is to be stationed a torpedo depôt ship.

Great Britain. "The coast defence of Great Britain is notably the most inefficient of any of the great European powers. Owing to the divided control, lack of co-operation, absence of digested schemes for mutual support, and the mixing of naval and military duties, the defence is unwieldy in its administration, unprepared for sudden work, and labours under the disadvantage of placing military men in situations outside their legitimate sphere of action.

Suggested alterations in the British system. "Recently, in view of the action taken by continental powers, the question has been agitated of transferring to the navy the entire system of coast defence, including submarine mining and the sea-coast fortifications. The idea has been discussed at some length between the War and Navy Departments, the former recognizing the arguments for the change, and the latter objecting only on the grounds of its already great administrative burden. At present, the defence afloat, with the exception of submarine mining corps, is in charge of the navy. The dock-yard garrisons are Royal Marine Artillery and Infantry. The sea-coast forts are manned by regular army, militia and volunteer artillery.

Divisions of work. "The submarine mine defences are confided to the Royal Engineers of the army, but the necessity for a certain amount of nautical skill

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is acknowledged in the present official composition of the submarine mining companies of the Royal Engineers. These companies are composed of sixty-two non-commissioned officers and men of the Royal Engineers, and sixty men recruited from the nautical population and enrolled in the militia of the district in which they are to serve as 'submarine miners.' The semi-nautical composition is necessary, since most of the work has to be carried on in vessels of greater or less size, and much of the time of land troops, without nautical knowledge, would otherwise be taken up in instructing the men to pull an oar and the officers to manage a boat in a tide-way. Naval officers of the present day are required to have a proficient knowledge of mining and countermining, as every modern battle-ship is supplied with a complete outfit of mines for her own protection and that of a harbour in which she may be lying, and every properly equipped modern war-ship has the necessary stores for running a line of counter mines.

"That it is a waste of men and money to maintain two separate organizations, one of them but indifferently qualified owing to lack of nautical skill, to do the same class of work, is well recognized by the British authorities. That the entire system of submarine defence has not been transferred to naval control is owing chiefly to lack of men available in their navy as at present organized."

It is as a rule undesirable to make organic changes without urgent necessity. It is better to work an imperfect system well than to work a perfect system imperfectly. We may have faith in the practical capability which in England provides a remedy for so many anomalies and defects in our constitution and administration, in civil, political, naval, and military affairs. Without radical changes we may utilise to a far greater extent than at present the services of officers retired from the navy. They would be eminently efficient in charge of a coast-defence force.

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CHAPTER V.

I.

SHIPBUILDING—RECENT CONSTRUCTIONS.

Ships launched, on the stocks, and ordered in 1888.

IT will be convenient to commence the present section with a summary view of the naval construction now in progress at home and abroad. For this purpose we may avail ourselves of a valuable paper communicated by a correspondent to the *Times*, and published in its issue of December 28.

Summary from the *Times*.

"The year 1888 has been one of unusual activity, not only in the Royal and private dockyards of Great Britain, but also abroad, and especially in Italy, Spain, France, and the United States. A new

Era of naval rivalry.

era of naval rivalry seems to have recently begun. States which not long ago were content to rank as third or fourth-rate maritime Powers now betray a tendency to push forward into the second, if not the very first, line, and the threatened disturbance of the old order of precedence among naval nations has already induced nearly every important country to adopt a fresh and more extensive shipbuilding policy.

"For the British Navy only one battle-ship, the Nile, was launched

The Nile.

during the year, and no battle-ship was laid down. The Nile, a turret ship of 11,940 tons displacement, was laid down at Pembroke in April, 1886, and launched on March 27, 1888. She is being completed at Portsmouth, and will, it is expected, be ready for sea in 1890. Of protected cruisers five were launched during 1888. The

Medea class.

list includes Melpomene, Marathon, and Magicienne, steel cruisers sheathed with wood and coppered, of 2950 tons displacement, and Medea and Medusa, steel cruisers, of 2800 tons displacement. The Melpomene was built at Portsmouth, and launched on September 20; the Marathon and Magicienne were both built by the Fairfield Company, at Govan, and were launched on August 23 and May 19 respectively. They will carry armaments of six 6-inch breechloading rifled guns, nine 6-pounders and one 3-pounder quick-firing guns, three machine guns and one light field gun, and will steam at an extreme speed of about 19¾ knots. The Medea and Medusa were

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laid down in April, 1887, at Chatham, and were launched, the first on June 9 and the second on August 11 last. Their armaments will be similar to those of the Melpomene class, but the vessels will probably steam about a quarter of a knot faster. Two composite sloops, each of 1140 tons displacement, were also launched in 1888—the Nymphe at Portsmouth on May 5, and the Daphne at Sheerness on May 29. The armament of each is eight 5-in. breech-loading and an equal number of machine guns. Engines designed to drive the vessels at fourteen-and-a-half knots on the measured mile, have been furnished by Scott & Co., of Greenock. A smaller sloop, the Melita, of 970 tons displacement, was launched at Malta on March 20. Her speed is 12½ knots, and her armament is similar to that of the Nymphe or Daphne. Of first-class gunboats, six have been launched within the year. Of those the Pheasant was launched at Devonport on April 10, the Partridge at Devonport on May 10, the Peacock at Devonport on June 22, the Pigmy at Sheerness on July 27, the Pigeon at Devonport on September 19, and the Plover at Pembroke on October 18. They are all cruising gun-vessels of the improved Rattler type, and of 755 tons displacement, with an extreme speed of 13¾ knots. They have wood-sheathed and coppered bottoms, and armaments of six 4-in. breechloading and four Nordenfelt machine guns. One torpedo gunboat, the Sharpshooter, was launched at Devonport on November 30. She is of 735 tons displacement, and will have an extreme speed of 21 knots. Her armament will consist of two 36-pounders and four 3-pounder quick-firing guns. The other vessels that have been launched are the Research, a paddle-wheel surveying vessel of 520 tons displacement, that was launched at Chatham on December 4, and the Ernest, a steel-plated river gunboat for use on the Nile. She was launched at Sheerness on March 27, after having been housed in for about two years.

Nymphe class.

Melita.

Pigeon class gunboats.

Sharpshooter.

Research.

Ernest

"Of British war-ships which have not yet been launched, but which are building or have been ordered, the most important are the two large protected cruisers Blake and Blenheim. Both have been designed by Mr. W. H. White. They are twin-screw steel vessels of 9000 tons displacement and 20,000 indicated horse-power, intended to steam 22 knots on the measured mile, and to carry enough coal for a trip of 15,000 nautical miles at the economical speed of ten knots. The Blake is being built at Chatham, the Blenheim by contract at the Thames Ironworks and Shipbuilding Company's yard. The length of each is 375 feet, and the beam 65 feet, and the armament will probably consist of two 22-ton breechloading and ten 6-inch quick-firing guns, together with eighteen 3-pounder quick-firing guns, four

Blake and Blenheim.

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Barham and Bellona.

torpedo tubes, and machine guns. The Barham and Bellona are two smaller protected cruisers, each of 1830 tons displacement, and having a speed of 19·5 knots. They are being built of steel, the former at Portsmouth, where she was laid down on October 22, and the latter in the Tyne by Hawthorne, Leslie & Co. They will each carry six 4·7-inch 36-pounder quick-firing guns and four 3-pounder quick-firing guns, together with two torpedo tubes and machine guns. At a speed of ten knots they will be able to steam 2600 miles. Still

Blanche class.

smaller are the protected cruisers Blanche, Blonde, Barracouta, and Barrosa, each of which is of 1580 tons displacement. The armament is similar to that of the vessels of the Barham type, but the speed will be 16·5 knots, and the radius of action, at ten knots, 3400 nautical miles. The Blanche and Blonde are building at Pembroke, and the Barracouta and Barrosa at Sheerness and Portsmouth respectively. Two smaller unprotected cruisers, the twin-screw sloops,

Basilisk and Beagle.

Basilisk and Beagle, are under construction, the former at Sheerness and the latter at Portsmouth. They are of 1170 tons displacement and will steam at an extreme speed of 14½ knots. To enable them to serve on distant stations they will be sheathed and coppered.

Vulcan.

A large torpedo depôt ship, the Vulcan, was laid down at Portsmouth on June 18. She is to be of 6620 tons displacement, and to steam 20 knots. She will carry eight 4·7-inch 36-pounder and twelve 3-pounder quick-firing guns and a number of second-class torpedo boats, and she will have coal to enable her to travel 12,000 miles at 10 knots. The engines are being constructed by Humphrys, Tennant & Co. The smaller vessels which are being

Smaller vessels.

built are exceptionally numerous. They include nine first-class gunboats, each of 805 tons displacement, and eight torpedo gunboats of the Sharpshooter type, each of 735 tons displacement. To the latter type belong the Spanker, building at Devonport, the Speedwell at Devonport, the Salamander at Chatham, the Seagull at Chatham,

Torpedo gunboats.

the Gossamer at Sheerness, the Sheldrake at Chatham, the Gleaner at Sheerness, and the Skipjack at Chatham. To the former type belong the Magpie, Redbreast, Redpole, and the Widgeon, which are building at Pembroke; the Goldfinch, which is building at Sheerness; the Lap-

1st class gunboats.

wing and Ringdove, which are building at Devonport; and the Sparrow and Thrush, which are building by the Greenock Foundry Company.

Summary.

These vessels may be regarded as improved "Pheasants." Summing up the constructive work of 1888, we find that we have launched, excluding the Ernest, which does not figure in the Navy List, seventeen vessels, with an aggregate displacement of 35,425 tons, and have set about building twenty-eight vessels, with an aggregate dis-

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placement of 41,065 tons. In addition, we have ordered or laid down, for the Special Service Australasian Squadron, five protected cruisers, each of about 2500 tons displacement and 19 knots speed, and armed with eight 36-pounder and eight 3-pounder quick-firing guns. These vessels will be named Pandora, Pelorus, Persian, Phœnix, and Psyche. For the same purpose we have also ordered two cruising gunboats of the Sharpshooter class, which will be named Whiting and Wizard. These vessels raise the total of our construction work taken in hand during the year to thirty-five ships, with an aggregate displacement of 55,035 tons.

Australasian squadrons.

"France next claims attention. During the year she has launched one armoured battleship, the Hoche, of 10,580 tons displacement, at L'Orient, and one armoured coast-defence turret vessel, the Phlégéton, of 1640 tons displacement, at Cherbourg. The Hoche, which was laid down as long ago as 1880, will be armed with two 52-ton guns, and will steam at 15 knots. She is completely belted, the strongest armour on her water-line being 18 in., and on her barbettes 16 in. thick. The Phlégéton will carry a 28-ton gun. Among the unarmoured vessels that have been launched the chief is the Cécille, a deck-protected iron and steel twin-screw cruiser of 5766 tons displacement, which was launched at La Seyne on May 3. She will steam at an extreme speed of 19 knots, and she carries six 5-ton, ten 5½-in. 3-ton, and ten machine guns. Of the other cruisers, the Troude, of 1877 tons displacement, was launched at Bordeaux on October 22. She is a steel, twin-screw, 19½-knot vessel, carrying two 5½-in. 3-ton breechloading and seven machine guns, together with five torpedo tubes. Exactly similar to her is the Lalande, and slightly smaller (1848 tons), though of similar armament and speed, are the Coetlogon, Cosmao, and Forbin, all of which were launched during the year. The only other important launch was that of the iron 'aviso-transport' Rance, at L'Orient. She is a single-screw ship of 1597 tons displacement, with a speed of 14 knots, and an armament of four 5½-in. and two 3½-in. breechloading, and four machine guns. Of the vessels that were laid down previous to 1888 and are still on the stocks, the most noteworthy are the ironclad Brennus, and the armoured gun-boat Cocyte. Among vessels laid down or ordered during the year are an ironclad battleship of 10,480 tons, since called the Trehouart, to be built at L'Orient, two armoured cruisers, each of 6297 tons, one of which, the Dupuy de Lôme, is building at Brest, and the other, as yet unnamed, at Rochefort. These vessels will steam at a speed of 20 knots, and will each carry two 7¾-in., six 6½-in., and 14 machine guns. They will be

France.

Hoche.

Phélgéton.

Cécille.

Troude.

Lalande.

Coetlogon.

Cosmao.

Forbin.

Brennus.

Trehouart.

Dupuy de Lôme.

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completely belted. Three unprotected first-class cruisers have also been begun, the Isly at Brest, the Jean-Bart at Rochefort, and the Alger at Cherbourg. Each is of 4162 tons displacement, will steam at a speed of 19 knots, and will carry four 6½-in., six 5½-in., and ten machine guns. The second-class cruiser Davoust, of 3027 tons, and the third-class cruiser Surcouf, 1848 tons, together with the torpedo cruisers, Vautour and Wattignies, each of 1273 tons, and two 'avisos-torpilleurs,' each of 321 tons, together with three torpedo scouts, each of 150 tons displacement, conclude the list, which thus comprises nine vessels of 28,751 tons displacement, launched, and 15 vessels, of 44,073 tons displacement, laid down.

Isly. Jean-Bart. Alger. Davoust. Surcouf. Vautour. Wattignies. Summary.

"Italy during the year has launched the ironclad barbette ship Re Umberto, of 13,298 tons: the torpedo gun-vessel Confienza, of 745 tons; the torpedo gun-vessel Monzambano, of 741 tons; the 'aviso-torpilleur' Saetta, of 317 tons; the steel despatch vessel Archimede, of 784 tons displacement; and the cruiser Piemonte, of 2500 tons, together with four gunboats, each of 108 tons displacement. The ironclads Sardegna and Sicilia, which were laid down some years ago, remain on the stocks at Spezia and Venice respectively. There have been laid down during 1888 four torpedo rams, each of 3530 tons; five torpedo rams, each of 2050 tons; one torpedo despatch vessel, of 317 tons; six torpedo gun-vessels, each of 741 tons; and two steel despatch vessels, each of 784 tons. The year's total is ten vessels, of 18,817 tons displacement, launched; eighteen vessels of 30,701 tons displacement, laid down or ordered.

Italy. Re Umberto, &c. Sardegna. Sicilia. Summary.

"Russia has launched no ironclads, either in the Baltic or in the Black Sea, neither has she launched any protected cruisers. Indeed, her most important launch was that of the steel 20-knot corvette Uraletz, at Nicolaieff. This is a vessel of 1224 tons displacement. Russia has also launched a steel twin-screw 14-knot gun-vessel of 950 tons. But what Russia lacks in launches she has made good in the laying-down programme. Russia has laid down in the Black Sea two ironclads, each of 8000 tons displacement, and in the Baltic one ironclad of 9800 and another of 6600 tons displacement. She has also laid down in the Baltic a steel-protected 18-knot cruiser of 4300 tons—these, in addition to the ironclad Imperator Alexander, which was begun previous to 1888. She has, moreover, laid down on the Neva a new steel 17-knot Imperial yacht, of 3346 tons displacement, to be called the Standard, and, in the Baltic, four new corvettes of the Uraletz type, each of 1224 tons displacement. Her year's work may be set down as two vessels, of 2174 tons displacement, launched and ten vessels, of 44,942 tons displacement, commenced.

Russia. Uraletz. Summary.

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"Germany has launched two 14-knot cruisers, Jagd and Sperber, Germany.
:h of 1300 tons, and four torpedo gun-vessels, each of 250 tons
placement. She has laid down an 18-knot cruising corvette of
30 tons, an armoured gun-vessel of 1200 tons, an ironclad of about
00 tons, a 14-knot cruiser of 1300 tons, and, it is said, more than
e of the ships which are comprised in her new naval programme.
t, without counting these, her year's work amounts to six vessels,
3600 tons displacement, launched, and four vessels, of 9930 tons
placement, begun."

The following summary of the new programme for Germany is from
Daily News:—

'The Government proposes during the next six years to lay down New Naval pro-gramme.
l complete for sea no fewer than twenty-eight war-ships, of which
ır are to be armoured battle-ships of the latest type, and nine coast-
'ence ironclads. There are also to be seven deck-protected cruisers,
ır fast unprotected cruisers, two armed despatch boats, and two sea-
ng torpedo gunboats. The estimated cost of all these additions to
German fleet is, in English money, £5,840,000. The new armoured
:tle-ships are intended to replace the Grosser Kurfürst, which, it will
remembered, was accidentally sunk some years ago in the Channel;
l the Kronprinz, Hansa, and Friedrich Karl, which are admittedly
eless for the purposes of modern warfare. Germany already
ssesses ten other seagoing armoured battle-ships, and the carrying
of the present scheme will bring the total up to fourteen. Of
st-defence armour-clads, she has now one obsolete, thirteen service-
e, and one on the stocks at Gaarden. By the year 1895 she will,
ording to the new plan, have twenty-three effective vessels of this
ss. Hitherto she has laid down no deck-protected cruisers; and
s the seven projected ships of this type will form an altogether
el feature in her Navy. Of unprotected cruisers she has now
nty-four. In six years' time she will have twenty-eight, but four
hese will in the meantime have become useless. The number of
despatch-boats will be raised from seven to nine, and that of her
edo gunboats, or 'torpedo division boats,' from five to seven."

The *Daily News* proceeds to give figures comparing the estimated
of the German ships with the actual cost of similar vessels built
the British Navy, from which it would appear that the Germans
e made a sanguine estimate of the cost of carrying out their
posals.

We now return to the *Times*:—"Austria has launched nothing of Austria.
importance, but she has laid down a ram cruiser of 4200 tons and
ther of 3800 tons displacement, and a despatch boat of 360 tons.

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completely belted. Three unprotected first-class cruisers have also been begun, the Isly at Brest, the Jean-Bart at Rochefort, and the Alger at Cherbourg. Each is of 4162 tons displacement, will steam at a speed of 19 knots, and will carry four 6½-in., six 5½-in., and ten machine guns. The second-class cruiser Davoust, of 3027 tons, and the third-class cruiser Surcouf, 1848 tons, together with the torpedo cruisers, Vautour and Wattignies, each of 1273 tons, and two 'avisos-torpilleurs,' each of 321 tons, together with three torpedo scouts, each of 150 tons displacement, conclude the list, which thus comprises nine vessels of 28,751 tons displacement, launched, and 15 vessels, of 44,073 tons displacement, laid down.

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Russia. Uraletz. Summary.

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"Germany has launched two 14-knot cruisers, Jagd and Sperber, each of 1300 tons, and four torpedo gun-vessels, each of 250 tons displacement. She has laid down an 18-knot cruising corvette of 4230 tons, an armoured gun-vessel of 1200 tons, an ironclad of about 3200 tons, a 14-knot cruiser of 1300 tons, and, it is said, more than one of the ships which are comprised in her new naval programme. But, without counting these, her year's work amounts to six vessels, of 3600 tons displacement, launched, and four vessels, of 9930 tons displacement, begun." Germany.

The following summary of the new programme for Germany is from the *Daily News*:—

"The Government proposes during the next six years to lay down and complete for sea no fewer than twenty-eight war-ships, of which four are to be armoured battle-ships of the latest type, and nine coast-defence ironclads. There are also to be seven deck-protected cruisers, four fast unprotected cruisers, two armed despatch boats, and two sea-going torpedo gunboats. The estimated cost of all these additions to the German fleet is, in English money, £5,840,000. The new armoured battle-ships are intended to replace the Grosser Kurfürst, which, it will be remembered, was accidentally sunk some years ago in the Channel; and the Kronprinz, Hansa, and Friedrich Karl, which are admittedly useless for the purposes of modern warfare. Germany already possesses ten other seagoing armoured battle-ships, and the carrying out of the present scheme will bring the total up to fourteen. Of coast-defence armour-clads, she has now one obsolete, thirteen serviceable, and one on the stocks at Gaarden. By the year 1895 she will, according to the new plan, have twenty-three effective vessels of this class. Hitherto she has laid down no deck-protected cruisers; and thus the seven projected ships of this type will form an altogether novel feature in her Navy. Of unprotected cruisers she has now twenty-four. In six years' time she will have twenty-eight, but four of these will in the meantime have become useless. The number of her despatch-boats will be raised from seven to nine, and that of her torpedo gunboats, or 'torpedo division boats,' from five to seven." New Naval programme.

The *Daily News* proceeds to give figures comparing the estimated cost of the German ships with the actual cost of similar vessels built for the British Navy, from which it would appear that the Germans have made a sanguine estimate of the cost of carrying out their proposals.

We now return to the *Times*:—"Austria has launched nothing of any importance, but she has laid down a ram cruiser of 4200 tons and another of 3800 tons displacement, and a despatch boat of 360 tons. Austria.

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Spain. "Spain has launched a steel 14-knot cruiser, of 1152 tons displacement, and a number of small craft of less than 100 tons. In addition, she has begun or ordered six belted cruisers, each of 7000 tons; two protected cruisers each of 4800 tons; a steel cruiser, the Ensenada, of 1046 tons; and four torpedo gun-vessels, each of 600 tons displacement. The protected cruisers are the Alphonso XIII., building at Ferrol, and the Lepanto, building at Cartagena.

Norway. Sweden. "Norway has been inactive. Sweden has laid down and is building at Gothenburg an armed turret ship, the Gota, which will displace

Denmark. 2915 tons and steam at 16 knots. Denmark has launched at Copenhagen the Valkyrien, a fine 17½-knot protected cruiser of 2900 tons, which will carry two 10-ton breechloaders, six 6-in. breechloaders and 14 machine guns. She has also laid down at Copenhagen a twin-screw double-turreted steel coast defence ironclad of 3290 tons, which will be capable of steaming 15½ knots, and will carry as her chief armament two 28-ton breechloaders. Both these vessels are of very powerful type.

Holland. "Holland has launched nothing larger than a torpedo boat, but she has laid down a 15-knot coast defence ironclad of about 2500 tons displacement, which will carry two 11-in. 28-ton Krupp guns as her

Portugal. principal armament. Portugal has launched two small gunboats each of 220 tons displacement, and has ordered four others. She has

Greece. also launched a gun-vessel, the Diego Cam, of 587 tons. Greece is having two small ironclads built for her abroad, but has launched

Turkey. nothing. Turkey has launched one or two torpedo boats, and has laid down one ironclad of 8600 tons, two composite cruisers of 1960 and 1160 tons displacement respectively, a torpedo despatch vessel of 900 tons, to steam 19 knots, and three torpedo gunboats of respectively 450, 230, and 120 tons displacement. Want of money threatens, however, to indefinitely postpone the launching of most of these vessels.

China "Of the Asiatic naval Powers, China has this year been upon the whole the more active. There have been launched for her in Europe an armoured turret ship of 2850 tons displacement, and a steel 15-knot cruiser of 1300 tons. At home she has launched a torpedo gun-vessel of 450 tons and a steel cruiser of 2500 tons. In the meantime she has laid down, or caused to be laid down, four torpedo cruisers, each of 1500 tons; four gun-vessels, each of 120 tons; and two gun-

Japan. vessels, each of 150 tons. By, or on behalf of Japan, there have been launched a small armoured gun-vessel, the Tisima, two cruisers of 1480 and 750 tons displacement respectively, and several torpedo vessels. There have been laid down two deck-protected cruisers,

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each of 4140 tons in Europe, and another of the same type at Yokosuka, and some seagoing torpedo boats.

"The United States Navy Department has of late been busily engaged in the carrying out of a somewhat extensive shipbuilding programme, which should be completed during the next three years. United States.

"The following ironclads of the Monitor type are completing:— Monitors. Puritan, 6000 tons, 3058 HP.; the Terror, 3815 tons, 838 HP. converting; the Miantonomoh, 3815 tons, 1030 HP. to be completed early in 1889; the Amphitrite, 3815 tons, 1000 HP.; the Monadnock, 3815 tons, 3000 HP. Each of these vessels will be armed with four 10-inch 26-tons guns. Five important vessels have been launched. The largest of these is the steel twin-screw deck-protected cruiser Baltimore, Baltimore. which was built by Crump & Sons, of Philadelphia, between May 5, 1887, and October 6, 1888, a period of only 17 months. She is of 4400 tons displacement, and is expected to steam at 19 knots under forced draught, and at 17 knots under natural draught. She has room for 900 tons of coals, a quantity sufficient to last her for a cruise of 12,000 sea miles at ten knots. The armament will be four 8-in. breechloading guns in sponsons, six 6-in. breechloading guns in broadside, six 6-pounder quick-firing guns, and six Hotchkiss and four Gatling machine guns. A second, but rather smaller, steel-protected cruiser, the Charleston, was laid down at the Union Iron- Charleston. works, San Francisco, and launched on July 19 last, after having been on the stocks only 11 months. She is of 3730 tons displacement, and is expected to steam 18 knots under forced draught. Her coal capacity is 800 tons, or sufficient for 6450 knots, steaming at 10 knots. Her armament will be two 8-in. breechloading guns mounted on the fore and aft midship line, six 6-in. guns in broadside, four 6-pounder quick-firing guns, and six Hotchkiss and four Gatling machine guns. The gun-vessel Petrel, which was recently launched Petrel. from the works of the Columbian Company, at Baltimore, is a small steel bark-rigged cruiser of 870 tons displacement. She will steam at a speed of 13 knots, and will carry four 6-in. breechloading guns in sponsons, two 6-pounder quick-firing guns, and two Hotchkiss machine guns. Another and larger gun-vessel, the Yorktown, was Yorktown. launched by Crump & Sons, of Philadelphia, on April 28. She is really a partially protected twin-screw torpedo cruiser of 1700 tons displacement, and she is expected to steam at 17 knots. Her armament is six 6-in. breechloading guns, five quick-firing guns, and two Hotchkiss and one Gatling machine gun, together with eight torpedo tubes.

"In addition the Americans launched on April 28 the Vesuvius, Vesuvius,

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dynamite cruiser. which is more generally known as the dynamite-gun cruiser. She is a steel twin-screw vessel of 805 tons displacement, and her extreme speed is 20 knots. She carries three 15-in. pneumatic tubes, placed abreast at a fixed angle of 16 degrees, and projecting through her deck near the bow. Each of the shells for these guns contains 600 lb. of explosive gelatine. During the year there have been laid down

Texas. two ironclad battle-ships. One of these, the Texas, has been designed by Mr. W. John, late manager of the Barrow Shipbuilding Company, and is being constructed at the Government Navy Yard at Norfolk. With 950 tons of coal on board, she will displace 6750 tons; and she will steam 17 knots under forced draughts. She will be armed with two 12-in. breechloading guns, placed in turrets *en échelon*, and with six 6-in. breechloading guns, four 6-pounder and four 3-pounder quick-firing guns, and eight Hotchkiss and two Gatling machine guns. The Texas will have a central armoured citadel, and a 3-in. steel deck ahead and astern of it. The cost, exclusive of that of the armament, is to be £475,200. The other ironclad battle-ship,

Maine. the Maine, is being built by Government at New York. She is to be of 6648 tons displacement, to be bark-rigged, and to steam at an extreme speed of 17 knots. She will carry four 10-in. breechloading guns mounted in pairs in two turrets, which will rise *en échelon* on the main deck. She will also carry six 6-in. breechloading guns, four 6-pounder and four 3-pounder quick-firing guns, and thirteen Hotchkiss and four Gatling machine guns.

Completed, Dolphin. Boston. Atlanta. Chicago. "The four cruisers completed for sea in 1888 are the Dolphin, unarmoured, 1435 tons, 2240 HP., one 6-in. 9-ton gun; the Boston and the Atlanta, armoured deck, 3189 tons, 3780 HP., two 8-in. 12-ton guns, and six 6-in. 9-ton guns; the Chicago, armoured deck, 4500 tons, 5084 HP., four 8-in. 12-ton, eight 6-in. 9-ton, and two 5-in. 7½ ton guns.

Laid down, Newark. "Five other vessels have also been laid down during the year—viz., the Newark, protected 17-knot steel cruiser of 4080 tons, at Philadelphia; the Philadelphia, protected 19-knot steel cruiser of 4410

San Francisco. Concord. tons, at Philadelphia; the San Francisco, protected 17-knot steel cruiser of 4080 tons at San Francisco; and the Concord and Benning-

Benning-ton. ton steel cruising 16-knot gun-vessels, each of 1700 tons, at Chester, Pennsylvania.

Chili. "The other American States have shown very little constructive activity. Chili has building, or is about to have built, in France a 7000-ton 19-knot cruiser, two protected cruisers of 2080 tons each,

Argentine Confederation. and in England two sharpshooters; the Argentine Confederation has begun a 14-knot ironclad of 4330 tons. Brazil has on the stocks a

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17-knot cruiser of 4023 tons, and is also building some torpedo vessels, and Uruguay has launched an iron gun-boat of 300 tons displacement. Mexico and Hayti have done nothing; and Peru has as yet taken no steps towards replacing the navy which it lost during the war with Chili." Brazil. Uruguay.

II.—ARMOURED SHIPS.

Great Britain.

We now proceed to consider in more detail the most important ships built and building for the various navies.

The Nile and the Trafalgar are the two most important ironclads on which the constructive department of the British Navy has been engaged recently. The Nile was launched in March, 1888. The Trafalgar six months previously. The following description of these vessels is from the *Times*:— Nile, Trafalgar. Description from the *Times*.

"The Nile is a sister ship to the Trafalgar, which is being prepared for her engine trials at Portsmouth, for it has been the practice (and possibly the policy) of the Admiralty, with a few notable exceptions, to produce their battle-ships in pairs. This was the case with the Colossus and the Edinburgh, the Impérieuse and the Warspite, the Ajax and the Agamemnon, and the Victoria and the Sans Pareil; and the practice is of distinct advantage and a safeguard against providing the Navy with a numerous progeny of ultimate failures. Ships built in pairs.

"Before proceeding to describe what kind of ship the country will in course of time obtain in the Nile for the million or so of money which she will eventually cost, it will be best, in order to provide against mistakes, to say what she is not. Though she divides with the Trafalgar the honour of being the heaviest armour-clad in the Service, she is exceeded in length by the Achilles and several other ships, and in beam by the Inflexible. She is not the fastest armour-clad, neither does she carry the largest ordnance afloat. Though the number, nature, and relative positions of her heavy guns are the same as in the Admirals, she differs from that class in carrying them in rotating turrets instead of on turntables in fixed barbettes. But, while the turret principle has thus been re-established, the Nile differs from the Victoria—the next latest embodiment of the system—in having double the number of turrets, and from the Inflexible and her successors, of the Edinburgh and Ajax classes, in the abandonment of the *en échelon* arrangement, as they are built forward and aft on the middle line of the ship, whereby direct fire ahead and astern is reduced by one-half. The Nile may be said to Nile compared with other ships.

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Resembles Dreadnought.

resemble the Dreadnought, upon which she was evidently modelled; but she has, among other advantages over her prototype, the important one of possessing a powerful auxiliary broadside battery high up between the turrets. The Nile has greater length, thickness, and depth of water-line belt than the Admiral class, and though she is not, like the early armour-clads, protected throughout her length by vertical armour, her invulnerability against the penetration of the heaviest guns afloat is immensely greater. Her engines will be of exactly the same horse-power as those of the Victoria; but, notwithstanding the fact that she exceeds the Tyne-built ship in displacement by considerably over a thousand tons, yet, in consequence of her superior lines and length, she is expected to realize the same speed.

"In short, it will be perceived that, although it has been declared impossible to design a perfect ship combining in herself the several excellences of different types, it has been the evident desire of the designers of the Nile to combine as many good points in her as possible by a series of compromises. The Nile will possess great speed and offensive powers combined with efficient protection for all vital parts.

"In the Nile curves of beauty, because they also happen to be of practical utility, have certainly not been lost sight of. Glanced at in midship section her sides taper gracefully downwards; while, if examined in plan, she presents the appearance of an elongated ellipse having ogival ends like the head of a Palliser projectile. Forward her armoured deck curves down from the lower citadel to the ram, while at the rear it is bent in the same way to support the stern post. The turrets are, of course, circular, but, for the purposes of protection against raking, the bases are inclosed within an upper citadel having rounded athwart bulkheads. The turrets themselves are surmounted by turtle covers, while the intervening box battery is octagonal in shape, and, consequently, is a near approach to a circle. In length the Nile measures 345 feet between perpendiculars and 73 feet in beam. Her load draught will be 27 feet forward and 28 feet aft. When fully equipped for sea, her displacement is 11,940 tons, and her engines are contracted to develope 12,000 horse-power under forced draught. The hull is built wholly of steel, the plating having an outer thickness of $\frac{3}{4}$ of an inch and an inner thickness of $\frac{5}{8}$ of an inch, while the bottom plates are $\frac{9}{16}$ of an inch.

"These details, however, will afford only an indifferent idea of the structural strength, because the portions of the hull carrying weight and exposed to strains and blows are specially thickened and

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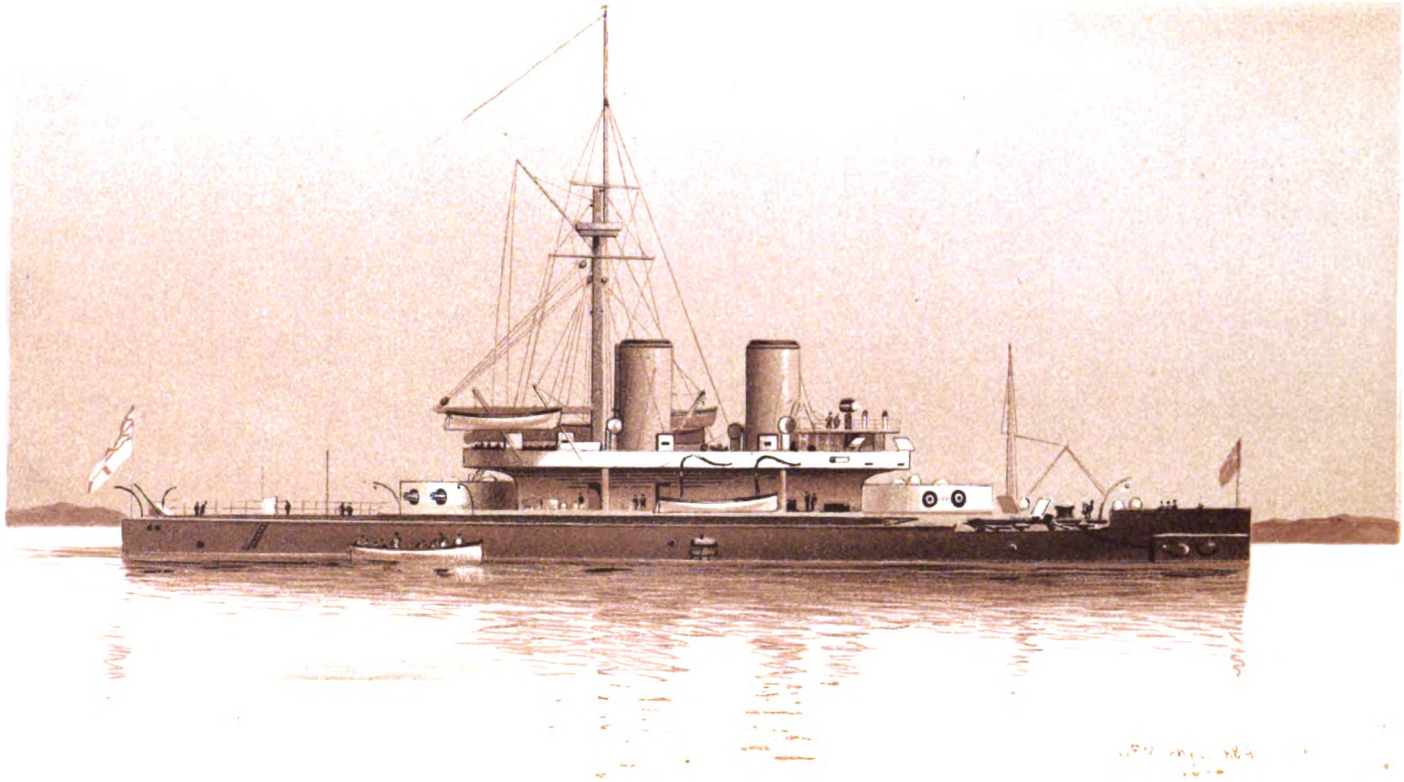

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H. M. S. "DREADNOUGHT."

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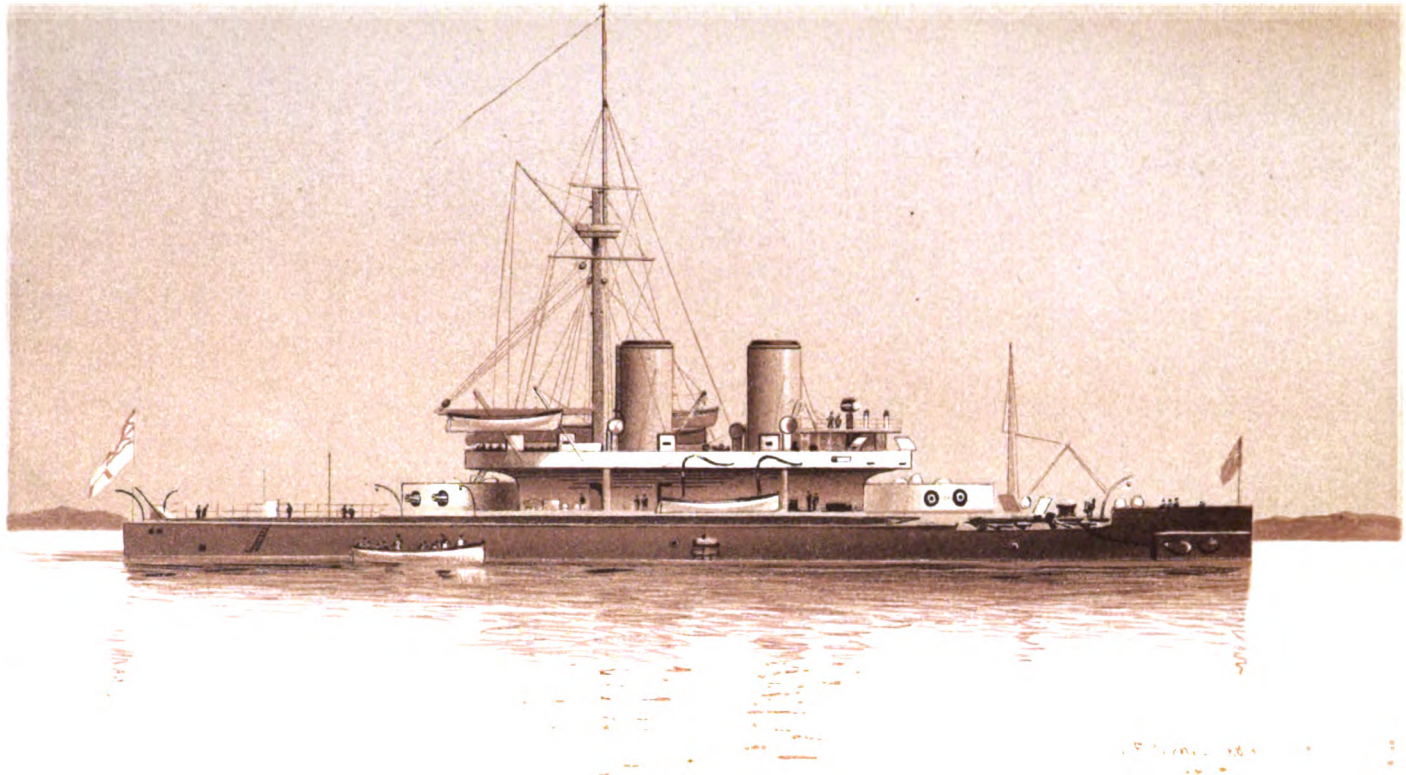

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H. M. S. "DREADNOUGHT."

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strengthened, more particularly in wake of the turrets and vertical armour. Thus, it is officially stated that the side of the hull behind the heavy plating consists of two thicknesses of skin, the outer of 60 pounds and the inner of 30 pounds a square foot, riveted to plate and angle frames 2 feet deep and 2 feet apart. Inside of these, again, frame plating of 20 pounds a square foot is worked, while the belt and citadel armour bolts are hove up between them on the inner end of a cast steel sleeve 12 inches long. Within these frames and behind the belt armour is a second system of lightened plate frames 3 feet deep, spaced 4 feet apart, upon the inside of which the outer bulkhead of the coal bunkers is riveted. Besides the solidity of the structural arrangements, the under-water portions are safeguarded by a unique subdivision double bottom, which is 3½ feet in height, and contain forty watertight compartments. There are also thirteen before the double bottom, and eighteen abaft, and forty-nine in the hold, including eight divisions in the coal bunkers, making altogether a total of 120 watertight compartments below the protective deck. In addition to the above, however, must be added fourteen similar compartments on the protective deck itself in wake of the water line, and, as these would be filled with stores, it is contended that they would give considerable buoyancy to the relatively limited unarmoured ends of the ship when riddled. As a matter of fact, it is asserted that, should the unprotected forward end be entirely filled with water, the resulting sinkage would only amount to 3½ inches, as compared with the 15 inches of additional sinkage of the Admiral class in similar circumstances. But, should these various compartments be flooded, it is important to notice that exceptional means have been taken to free them. This may be done either by hand or steam power, or by both in combination, Downton's pumps being used for hand, and the circulating pumps as well as the bilge pump donkey engines for steam power. Each of the two main circulating pumps will be powerful enough to discharge 1000 tons of water from the bilge in every hour in case of leak, while the two pumping engines and the couple of auxiliary engines can also be called into requisition for the same purpose.

Structure behind the armour.

Subdivision into compartments.

Sinkage when ends are riddled.

Pumping power.

"When it is stated that the Camperdown would carry four 67-ton guns into action upon a displacement of 10,000 tons, and that the Nile would do no more with a displacement of 12,000 tons, it will be readily surmised that the latter must possess commensurate advantages in the way of armoured stability and protection. Her total weight of armour, exclusive of glacis plates and protective decks (which may be roughly said to represent an additional 1000 tons) is

Height of armour.

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not less than 4230 tons. The disposition of this enormous mass of compound armour is the distinctive feature of the hull. In the first place the Nile is fitted with a belt thicker, longer, and extending both higher and lower than that of the Admirals. It has a length of 230 feet, and a breadth of 8 feet 6 inches, and forms, with the boundary bulkheads, the lower citadel. The side is thus protected for 5 feet 6 inches below, and 3 feet above the water. The plating varies in thickness from 20 inches to 14 inches, tapering at the lower edge from 8 inches to 6 inches, while the bulkheads are armoured with 16 inches and 14 inches plating forward and aft respectively, tapering downwards to 7 inches. It will be seen that each of the ends is denuded of vertical armour for the space of 58 feet. They are, however, protected by a 3-inch sloping steel deck in continuation of the belt. Above the lower or belt citadel is the citadel proper, 141 feet long at the sides of the ship, but having an extreme length from the centres of the curved bulkheads of 193 feet. The plating varies from 18 inches to 16 inches, while the thickness of the bulkheads which protect the bases of the turrets from raking has been perilously reduced to 8 inches. The main deck between the ends of the citadel and the end of the armoured belt is covered with two thicknesses of steel plating, similar deck-arming forming the upper deck over the citadel. These figures will afford an idea of the defensive capacity of the ship, but in reality, in consequence of the peculiar arrangement of the framework and backing, the protecting barricades are of much greater solidity.

Length of citadel.

"It also remains to be stated that, owing to the great length of the main citadel, it has been deemed expedient to subdivide it into three compartments by means of steel bulkheads, as a defence against splinters. The turrets are built at each end of the citadel. Within the limits of the armoured belt, and circumferentially to the parabolas of the boundary bulkheads, they are armoured to the thickness of 18 in., and will each mount a brace of 67-ton breechloaders. Both guns and turrets will be worked by hydraulic power. Superimposed upon the citadel is a box battery pierced for six of the new 4·7 inch 45-pounder quick-firing guns. The ship will also have seventeen 6-pounder and 3-pounder quick-firing guns, four machine guns and eight tubes for discharging torpedoes. As the side of the battery is only built of 1-in. plating, the gun crews will be exposed to the fire of the smallest guns. The central portion of the Nile is a three-story arrangement; and, as the turrets are not less than 120 ft. apart, it is, perhaps, to be regretted that some portion of the intervening armoured side, which rises to the height of 11 ft. above the

Division of citadel by steel bulkheads.

Auxiliary armament.

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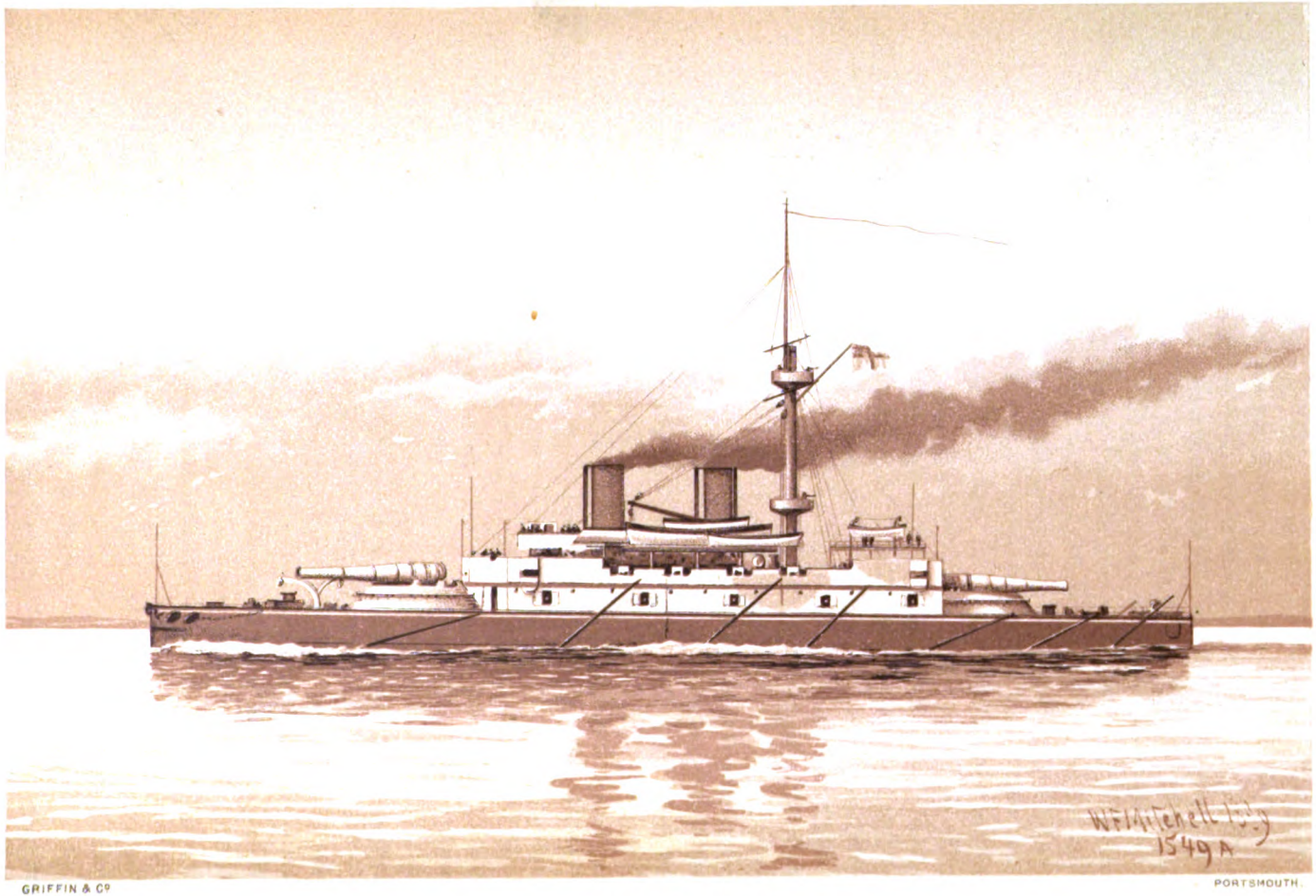

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water, was not made available for a few thoroughly protected guns. In the Nile, as in the Trafalgar, the magazine and shell rooms are located at the lower part of a watertight tunnel, which passes between the two sets of engines and boilers, and affords a means of communication between the ends of the ship."

Magazine and shell rooms.

On the occasion of the launch of the Trafalgar, a notice appeared in the *Nautical Magazine*. The following extracts are borrowed from that paper. Commencing with a reference to the more extended protection by armour, the writer observes:—

Trafalgar. *Nautical Magazine.*

"In some of the earlier ironclads no difficulty was found in armour-plating the whole length of the ship to such a height as to ensure protection for a broadside of guns extending fore and aft. The armour, however, was only 5½ inches thick. As guns developed, so it became necessary to increase the thickness of armour, and for a time this could be done by simply reducing the dimensions of the battery in accordance with the reduced number of guns needed, when each gun was so much heavier. In the Dreadnought, completed in 1875, armour 14 inches thick was used, and a sufficient area of the ship's side was armoured to secure the complete safety of the ship, and full security of the men at the guns while the armour was unpierced. The Dreadnought carries four 38-ton guns in turrets, each turret being placed at the end of a central citadel enclosing the engines and boilers. Forward and aft of the citadel, she has a belt of armour at the water-line extending to stem and stern, and an armoured deck level with the top of the belt. In the ironclad next built to meet still heavier guns, 24-inch armour was carried, but it was in two thicknesses, and was for this reason probably not more efficient than a solid plate of 5 or 6 inches less thickness. To carry this, however, it was found necessary to limit still farther the area of protected surface, and thus in the Inflexible there is an armoured citadel, but the ends of the vessel are destitute of armour. The unarmoured portion of the vessel, however, is minutely subdivided (some of the compartments being filled with cork), and it was considered that, even if it were riddled, the vessel would still in moderate weather be fairly safe. In succeeding ships the area of armoured surface was still further reduced, not, however, by further decreasing the length, but the height of the armoured surface. It is on this ground that the designs of recent English ironclads, and notably those of the 'Admirals'—so called because they are named Collingwood, Benbow, Anson, Rodney, and Camperdown*—have been so

Early ironclads.

Dreadnought.

Inflexible.

Admiral class.

* The Benbow carries two 110-ton guns. The Howe, Rodney, Anson, and Camperdown four 67-ton guns, and the Collingwood four 45-ton guns.

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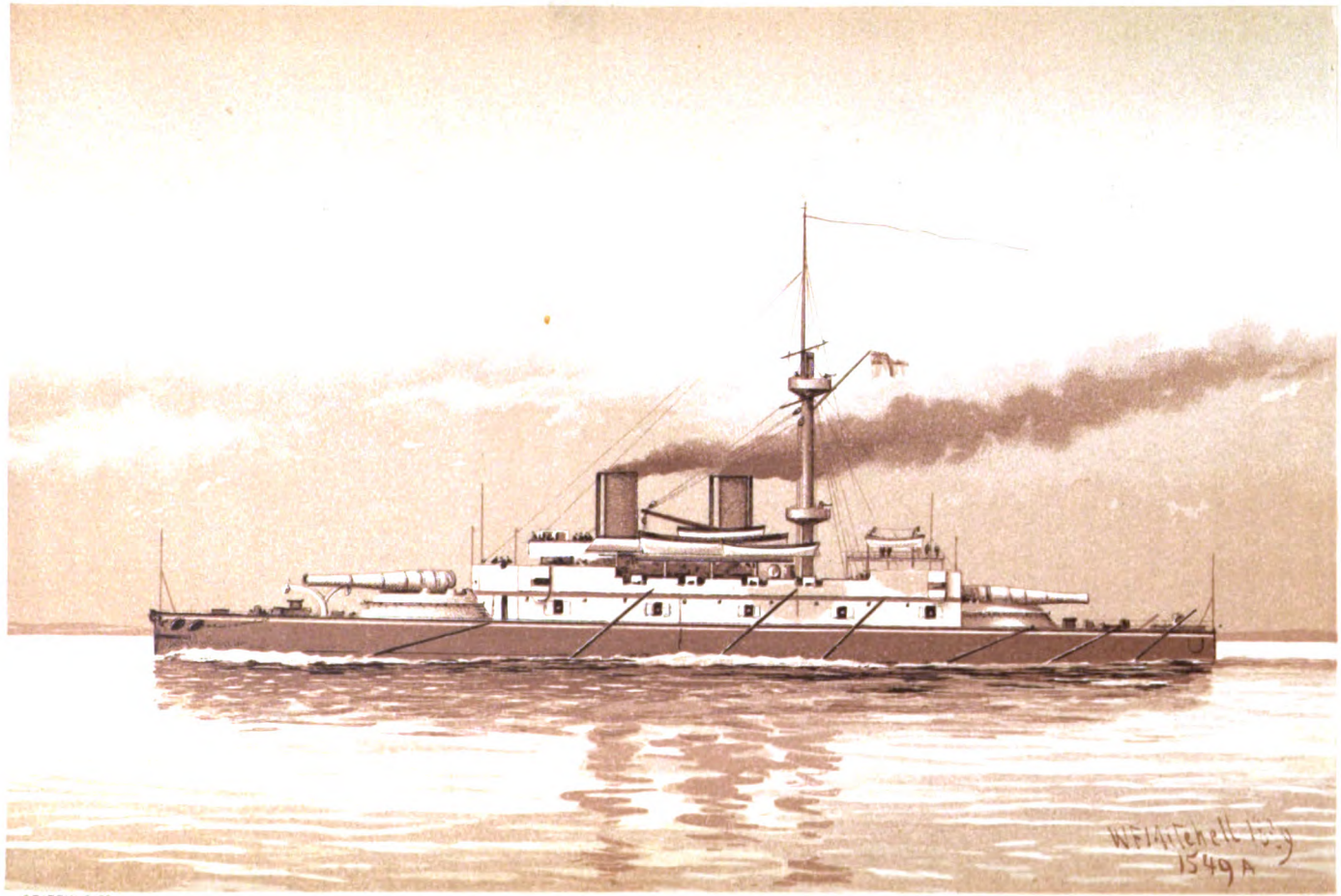

H.M.S. "BENBOW."

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water, was not made available for a few thoroughly protected guns. In the Nile, as in the Trafalgar, the magazine and shell rooms are located at the lower part of a watertight tunnel, which passes between the two sets of engines and boilers, and affords a means of communication between the ends of the ship."

Magazine and shell rooms.

On the occasion of the launch of the Trafalgar, a notice appeared in the *Nautical Magazine*. The following extracts are borrowed from that paper. Commencing with a reference to the more extended protection by armour, the writer observes:—

Trafalgar. *Nautical Magazine.*

"In some of the earlier ironclads no difficulty was found in armour-plating the whole length of the ship to such a height as to ensure protection for a broadside of guns extending fore and aft. The armour, however, was only 5½ inches thick. As guns developed, so it became necessary to increase the thickness of armour, and for a time this could be done by simply reducing the dimensions of the battery in accordance with the reduced number of guns needed, when each gun was so much heavier. In the Dreadnought, completed in 1875, armour 14 inches thick was used, and a sufficient area of the ship's side was armoured to secure the complete safety of the ship, and full security of the men at the guns while the armour was unpierced. The Dreadnought carries four 38-ton guns in turrets, each turret being placed at the end of a central citadel enclosing the engines and boilers. Forward and aft of the citadel, she has a belt of armour at the water-line extending to stem and stern, and an armoured deck level with the top of the belt. In the ironclad next built to meet still heavier guns, 24-inch armour was carried, but it was in two thicknesses, and was for this reason probably not more efficient than a solid plate of 5 or 6 inches less thickness. To carry this, however, it was found necessary to limit still farther the area of protected surface, and thus in the Inflexible there is an armoured citadel, but the ends of the vessel are destitute of armour. The unarmoured portion of the vessel, however, is minutely subdivided (some of the compartments being filled with cork), and it was considered that, even if it were riddled, the vessel would still in moderate weather be fairly safe. In succeeding ships the area of armoured surface was still further reduced, not, however, by further decreasing the length, but the height of the armoured surface. It is on this ground that the designs of recent English ironclads, and notably those of the 'Admirals'—so called because they are named Collingwood, Benbow, Anson, Rodney, and Camperdown*—have been so

Early ironclads.

Dreadnought.

Inflexible.

Admiral class.

* The Benbow carries two 110-ton guns. The Howe, Rodney, Anson, and Camperdown four 67-ton guns, and the Collingwood four 45-ton guns.

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severely criticised, and the vessels themselves are so largely mistrusted by naval officers. The side-armour on these vessels consists of a belt 150 ft. in length (the ship being 330 ft. long), and extending from 5 ft. below to 2 ft. 6 in. above the load-line. The large guns are carried at each end of the armour-belt in a barbette, which is, in fact, a fixed armoured tower, furnishing protection for the mechanism for working the gun, and partial protection for the gunners. The space above the armour-belt and between the barbettes is occupied by a battery of smaller guns, and there are end armour bulkheads which, with the barbettes, protect this battery from a raking fore-and-aft fire. There is an armoured deck, 3 in. thick, level with the top of the armour-belt, and there is also an armoured (3 in.) deck at each end below water. The unarmoured ends at the water-line are minutely subdivided, and are filled with stores, &c., as far as practicable. From this brief description it will be seen that the safety of the ship, her buoyancy and stability are to a large extent dependent upon portions of the structure which are not protected by armour. With the unarmoured ends riddled, one of the 'Admirals' will sink about 15 in., and this brings the upper edge of her armoured belt within 15 in. of the water-line, and thus, if in this condition the side above the armour is riddled also, the vessel is very likely to capsize, and that while her armour is intact. Still, the 'Admirals' are powerful ships for offensive purposes; they will carry the heaviest guns yet mounted afloat, will steam 17 knots, and are well provided with small guns of various types. The Italians, in their large ships, have completely abandoned side-armour, and trust the safety of the ship to the unarmoured, but minutely subdivided, structure above an armoured deck, extending fore and aft, placed below the load-line, and serving as a protection to the engines, boilers, and magazines. The turrets and the bases of the turrets are heavily armoured; and so also are all apertures in the armoured deck, the lower parts of the funnels, the communications with the magazines, &c. The five large Italian ships all carry 100 to 102-ton guns,* and steam 18 knots. They are, and are likely to be, the fastest and most heavily-armed first-rate warships afloat.

Sinkage.

Italian ships.

"As bearing upon the value of armour, and the measure of safety which may be secured by minute subdivision, it may be mentioned that the quick-firing gun has developed so rapidly that even now there are weapons of this type that will fire 6-lb. shells at the rate of ten aimed rounds a minute. On the other hand, very heavy ordnance is necessarily unwieldy and slow in working. On this question, an

Quick-firing guns.

* See alphabetical list of Italian ships for recent decision as to description of guns.

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able naval officer recently remarked as follows:* 'I maintain that the chances of hitting with small guns are something like a thousand to one in their favour as compared with the big guns, not only on account of the rapidity of the fire and of the number carried, but also in consequence of the ease of pointing them. A ship in motion is an exceedingly difficult thing to hit with a big gun, even on a steady platform. You *might* do it, and sink your enemy the first moment of going into battle; but what we must look at is, what are the chances? The action is begun with the small artillery, and they make a heavy smoke, whilst both the ships are rolling, and the captain of the turret does not know whether he is going to pass to port or starboard of the enemy. If you have your gun on the starboard side, you will not have time to get it round to the port side, and in the excitement the big gun will probably miss.' These and other considerations have led the bulk of naval officers to have great faith in side armour, and to maintain that it is necessary for the first-class battle ship to have so much area of armoured surface as to be safe while her armour is unpierced. Such ships alone can keep the sea in face of all enemies; and they are, consequently, essential to the nation which must be the first naval power in the world or nothing. The Trafalgar is designed to meet these views, and is consequently the type of ironclad trusted in the Navy. Comparing the Trafalgar with the Dreadnought, and also with a recent ironclad the Benbow, we find as follows:—

	Dreadnought.	Benbow.	Trafalgar.
Length	320 ft.	330 ft.	345 ft.
Breadth	63 ft. 10 in.	68 ft. 6 in.	73 ft.
	Tons.	Tons.	Tons.
Load Displacement . . .	10,820	10,000	11,940
Indicated HP	8000	11,550	12,000
Speed in knots	14·2	17·	16·5
No. of guns	4	12	12
Heaviest gun	38	110	67
Total weight of Armour . .	3260	2900	4230
Thickness of Armour . . .	14 in.	18 in.	20 in.

* Captain Fitzgerald, R.N., at meeting of Institution of Naval Architects, 1st April, 1887.

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"In the Dreadnought the armour was ·296 of the total displacement of the ship; in the Benbow ·290, and in the Trafalgar ·352.

Estimated cost.

"As might be expected, the Trafalgar will not only be the largest, but the most costly, ship yet built for the English navy. It is stated that her hull, fittings, and equipment will cost £686,000, her propelling machinery £94,000, gun mountings £46,278, torpedo gear £3100, and her guns £56,340, making a grand total of £885,718. The Inflexible, the most costly of former ships, came to £810,000. 'This sum,' said recently the Director of Naval Construction, 'represents twelve first-rates of the year 1800, seven of 1840, and three and a half of 159 (with engines). For the same sum of money there could now be built four protected cruisers steaming 20 knots per hour, and carrying guns capable of piercing 20 inches of wrought iron at 1000 yards; or a fleet of 30 to 40 torpedo craft of various sizes, steaming 20 to 25 knots per hour.'

"The engines of the Trafalgar are by Messrs. Humphrys, Tennant and Co.

"As the Trafalgar is not as yet in a sufficiently advanced condition to be retarded by the want of her armament, her progress has been comparatively rapid. Last September the launch of this our largest armourclad took place, and since then there has been a growing concurrence of opinion that the turret ship combines as far as possible all the elements of attack and defence. At first an exception was taken to her on the ground of expense, but the substantial savings upon the estimates already shown, and the probability that further reductions will take place have gone far to meet the objections raised on the score of cost."

The Nile.

The total estimated cost of the hull, machinery, gun mountings, &c., of the Nile when complete in every respect, exclusive of her guns, is £803,826; and including the guns, is £857,070.

Bottom corroded while lying at Pembroke.

When the Nile was docked recently at Portsmouth it was discovered that the red lead with which her bottom was coated had extensively peeled off, and that a corrosion of the plating all along the water-line on both sides had taken place. The starboard side amidships was very much pitted, though, as a rule, the pitting and scoring were tolerably uniform. The rivet heads were greatly corroded, and in many instances appeared to be completely eaten away. The vessel was launched at Pembroke on March 27th, 1888, since which time, as there is no dock accommodation at that yard, she has been afloat in her launching trim without any opportunity occurring of examining and protecting the under-water parts of the hull.

Having dealt with the only two battle-ships laid down by the

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present Board of Admiralty previous to the production of the new programme of shipbuilding, to which we shall refer in more detail in a separate chapter, let us turn to the two principal battle-ships included in Lord Northbrook's programme, as approved by Parliament in 1885, viz., the Victoria and the Sans Pareil.

Victoria, Sans Pareil.

The Victoria, launched in April, and the Sans Pareil in May, 1887, went through their steam trials with success, the one in June and the other in September, 1888. Details of the steam trial of the Victoria appeared in the *Times* of June 16, 1888.

"The powerful turret ship Victoria, so named in honour of Her Majesty's Jubilee, completed her steam trials at the Nore on Thursday. The first rivet was driven in her keel plate by Lord Armstrong at Elswick in June, 1885, and she was launched on the 9th of April last year. In respect to the essentials of speed, protection, and armament, the Victoria is without a competitor in the navies of Europe. In design she may be said to resemble a magnified Hero; and though exception has been taken to the curtailment of her armour belt, which extends for 162 feet over her total length of 340 feet, and to the alleged dangerous concentration of her heaviest guns in a single turret, it must not be forgotten that naval construction is only possible on the principle of compromise, and that it is more satisfactory to judge of the efficiency of a battle-ship by the balance of advantages she gains by sacrificing something in her design. Comparing the Victoria with the crack French armourclad Amiral Baudin, we find that the latter possesses a complete belt at the water-line of the uniform thickness of 21½ inches, while the English ship is only partially protected by a belt varying in thickness from 16 inches to 18 inches; and that whereas the Frenchman carries three heavy guns in as many barbettes, the English vessel has her two 110-ton guns boxed up in a single turret. But, on the other hand, while the redoubt and turret of the Victoria are built up of armour 18 inches thick, the barbettes of the Amiral Baudin are of the thickness of 16¼ inches. The former is also more powerfully armed and engined, has a wider area of action, and is superior in speed in the ratio of 17 knots to 15 knots under forced draught. And all these advantages she carries into action upon, in round numbers, a thousand tons less displacement, besides being protected against raking fire by a bulkhead 16 inches thick and an angular screen of 6-inch plating. Had it been determined to continue the Victoria's belt throughout the sides upon the same displacement, it would have been necessary to reduce the armour from a uniform thickness of 18 inches to 14 inches and 12 inches, or, on the other hand, had the belt been continued to the ends without

Victoria and Amiral Baudin.

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thinning it in the middle and making it 12 inches at the extremities, the displacement of the ship must have been increased to 11,000 tons. As she now exists, the estimated loss of buoyancy by the complete riddling of the unarmoured ends amounts to 41 tons, representing a total sinkage of two inches.

Armament.

"Her armament will consist of two 110-ton breechloaders, which discharge projectiles of 1800 pounds, with *maximum* charges of 900 pounds, each gun being capable of firing ahead, and also, in consequence of the conformation of the superstructure, on the side within an arc of 150 degrees; one 30-ton gun, firing astern and on either quarter; twelve 6-inch 5-ton guns, twelve 6-pounder and nine 3-pounder quick-firing guns, besides machine guns for smaller ammunition. In other words, the Victoria will be able to discharge from the broadside 4750 pounds of metal simultaneously, consuming 3000 pounds of powder. She is also fitted with eight torpedo

Complement.

dischargers. This stupendous fighting machine will have a complement of 550 officers and men, of whom 110 will be engineers, stokers and other non-combatants. According to the Naval Estimates for the current year, the total cost of the Victoria, including hull, machinery, and guns, is £844,922.

Engines.

"The Victoria has been supplied with twin-screw triple-expansion engines by Messrs. Humphrys, Tennant and Co., of Deptford. The cylinders are 43 inches, 62 inches, and 96 inches in diameter respectively, with a stroke of 4 feet 3 inches. The contract power is 12,000 horse power, with forced draught and enclosed stokeholds, and 7500 horse-power with open stokeholds. They are by far the largest triple-expansion engines yet supplied to the Navy, and are practically identical in design with the engines of the same power which are now being fitted by Messrs. Humphrys and Tennant to Her Majesty's ship Sans Pareil, sister ship to the Victoria, built by the

Boilers.

Thames Iron Works, Blackwall. Steam is supplied at a working pressure of 135 pounds by eight 4-furnace boilers, constructed entirely of steel, and disposed in four separate and independent stokeholds.

"On the occasion of the trial with open stokeholds, or, as it is sometimes, but erroneously, termed, under natural draught, made under the superintendence of Captain Stevenson, C.B., the head of the Medway Steam Reserve, the collective indicated horse-power was 8038·04, or

Steam trials.

538 horses in excess of the contract. The mean speed realized, as measured by patent log, was 16 knots.

"The comparative ease with which these results were obtained, and the freedom during the run from any symptoms of priming or heating, augured well for the success of the trial under forced draught,

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upon the results of which would depend the value of the ship as a fighting machine in moments of exceptional emergency. The forced draught trial was made under the superintendence of Captain Ferris. For the purpose of the trial the ship was brought down to her load-line by water and ballast—namely, 26 feet 3 inches forward, and 27 feet 3 inches aft, so that her performances on the trial may be considered as closely approximating those which she would be capable of fulfilling on actual service. The following are the hourly returns obtained during the run :— Her trim.

Revolutions.		Indicated Horse-power.		Collective Power.
Starboard.	Port.	Starboard.	Port.	
102·4	101·2	7344·16	7231·71	14,575·87
100·8	100·4	7078·27	7054·01	14,132·28
101·3	100·0	6969·24	7157·12	14,126·36
100·7	100·1	7039·03	7104·62	14,143·65

"The means of the observations taken during the four hours' steaming gave an indicated power of 14,244·54 horses. The speed of the ship was over 17¼ knots, the entire series of results being obtained at an expenditure of two pounds of coal for every indicated horse-power an hour."

The trials of the Sans Pareil were thus described in the *Times* of September 25th, 1888 :—

"The Sans Pareil is in every respect a sister ship to the Victoria, built by Lord Armstrong's Company on the Tyne, and launched by Mrs. Forwood. Her engines, by Messrs. Humphrys, Tennant and Co., are of the same triple-expansion type; that is to say, the ships are the quickest and most powerfully armed, and, with two or three exceptions, the heaviest battle-ships in the service; or, to descend to particulars, it may be desirable to state briefly that they measure 340 ft. by 70 ft., have a displacement of 10,470 tons, carry a brace of 10-ton guns in their single turrets, and are armoured to the thickness of from 16 in. to 18 in. at the sides, and 16 in. at the bulkheads, while the turrets are constructed of 18-in. compound plates. The engines are contracted to develop 12,000 horses under forced draught, and are designed to propel the vessels at a speed of 17 knots when exerting their maximum power; while, in consequence of the triple-expansion principle, the consumption of fuel is so small, comparatively, Sans Pareil. Displacement. Horse-power of engines.

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Complement.

Shelling machinery.

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Displacement.

Horse-power of engines.

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Coal supply.

that the 1200 tons of coal which their bunkers are capable of stowing will, it is estimated, be sufficient to enable the ships to steam 7000 knots, or from England to New York and back, at the rate of 10 knots. When, therefore, we take into consideration the number of the mechanical moving parts and reciprocations, the enormous boiler pressures (135 lb.) to be generated and controlled, the exceptional power to be developed, and the weight of the bulk to be moved through the water, it is impossible not to be struck by the perfection to which modern engineering skill has attained, when those in charge of the machinery can regard the steam trial under natural draught as a mere preliminary spin round, or preparation for the crucial run with closed stokeholds; and when, after allowing one day for sweeping tubes, they can proceed to sea the next morning and greatly exceed the contract power, without, as it were, so much as turning a hair. This was what was achieved in the two instances of the Victoria and the Sans Pareil. With open stokeholds the engines of the Sans Pareil gave a collective indicated power of over 8000. This total was more than 500 horses in excess of the contract, the mean speed of ship, as measured by patent log, being 16 knots.

Closed stokehold trial.

Horse-power developed.

"With closed stokehold the engines developed a collective power of 14,482·77. Extraordinary as were the results achieved at the trial of the sister ship, the trial of the Sans Pareil not only confirmed but surpassed them. For, while the power developed at the trial of the Victoria gave an excess of 2244·54 beyond the guarantee, the mean collective power indicated by the Sans Pareil showed a gain of no less than 2482·77 above the contract. The average speed realized

Speed.

on the occasion was 17·75 knots. On the conclusion of the run the Sans Pareil was circled to port and starboard, and the engines were tested for stopping, starting, and going astern, with very satisfactory all-round results."

Jubilee gift from the Navy to Her Majesty the Queen.

The presentation of a Jubilee offering by the naval services to the Queen, consisting of silver models of H.M.S. Britannia and Victoria, brought out in a striking manner the transitions of the last fifty years in the building of ships for the purposes of war. The following notice appeared in the *Times* of October 12th, 1888 :—

Britannia.

"The Britannia was a wooden three-decker sailing ship, designed by Sir William Rule, in 1812, to carry 120 guns. She was built at Plymouth and was launched in 1820, the following being her leading particulars :—Length of lower deck, 205 ft.; extreme breadth of lower deck, 53 ft. 8 in.; depth of hold, 23 ft. 3 in.; tonnage, 2,602

Displacement.

(4672 tons displacement); draught of water, 26 ft.; spread of canvas in the sails, 12,600 yards. Her armament consisted of thirty-two 32-

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pounders on her lower deck, thirty-four 24-pounders on her middle deck, thirty-four 18-pounders on her main deck, six 12-pounders and ten 32-pounder carronades on her quarter-deck, and two 12-pounders and two 32-pounder carronades on her forecastle. This armament was several times altered, but that of 1835 has been followed in the model as representing the appearance of the ship in 1837, at which date she was a type of the most formidable line-of-battle ship afloat. In firing a broadside from 60 guns the approximate weights were—shot 2900 lb. and powder 650 lb. Her crew consisted of 50 officers and 1050 seamen, marines, and boys. She was the flagship at Portsmouth from 1835 to 1840, and in the Mediterranean in 1841. Subsequently, when on the Mediterranean Station, from 1850 to 1855, she carried the flags of Admiral of the Blue, Sir W. Parker, and Rear-Admiral of the Red, J. W. D. Dundas. In 1850 she was fitted up and employed as a training-ship for naval cadets at Portsmouth. In 1862 she was transferred to Portland, and in 1863 to Dartmouth, where she served for the same purpose until 1869, when she was broken up and replaced by another vessel to which the same name was given.

Armament.

Weight of broadside.

Complement.

"Such is the old three-decker, which presents a marked contrast to the Victoria, an armour-clad first-class battle-ship, built entirely of steel by Sir W. G. Armstrong, Mitchell & Co., and launched in 1887."

After giving some of the details contained in the earlier description of the Victoria, the writer continues as follows:—

"Besides her main engines, the Victoria has nearly seventy auxiliary engines for steering, hoisting boats, air compressing, electric lighting, revolving the turret, weighing anchor, and working the hydraulic machinery by the aid of which all the heavy work of the ship is performed. Her complement of hands is thereby reduced, being only 550 instead of the 1100 men required in the Britannia which had not one steam engine on board. The Victoria carries thirteen boats, four of them being propelled by steam, including a 56-feet torpedo boat. Her armament consists of two 111-ton guns carried in a revolving armour-protected turret, each gun firing by electricity a shot weighing 1800 lb., propelled by a powder charge of 960 lb., so that the destructive energy of one shot is nearly equal to that of the whole broadside of the Britannia. She also carries one 10-inch 29-ton stern gun, 12 6-inch 5-ton broadside guns, and several Nordenfelt and other quick-firing machine guns, some of which are placed in the fighting top of her single mast. The total weight of projectiles in a broadside is 4700 lb., projected by 2320 lb. of powder. She is also armed with

Victoria.

Complement.

Armament.

Weight of broadside.

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twenty-four Whitehead torpedoes, which can be discharged both above and below water. Her armour varies in thickness from 14 inches to 18 inches, and she is furnished with torpedo defence netting, as well as with four search towers, from which the electric light will sweep the water in all directions. She is commanded from an armour-protected conning station placed nearly over her turret, from which all the operations of propelling, steering, and fighting the ship will be directed.

Armour.

"Turning to the models of these widely differing vessels, we may observe that that of the Britannia is 25 inches long, or including the bowsprit and spanker-boom 31½ inches. To the top of the mainmast the height is 20 inches. The ship is treated as moored to a buoy in harbour, the smooth water being represented by a sheet of uneven pale green, dull, silvered glass. All the ports are open, and the guns run out, and the hammocks are all in the netting. She carries nine boats, of which the launch, the pinnace, and the barge are hoisted inboard, while two 10-oared cutters are hanging from the davits and the captain's gig is in the water astern, attached to a Jacob's ladder by a painter. In order to realize what the reduction to 1-120th of the full size means we may instance her anchors, which weighed 110 cwt. each, but which in the model are only 1¾ inches long and weigh ¼ oz. troy. In her rigging about 5000 feet of wire are employed in making up the shrouds, and stays, and other ropes, which are all three or four stranded according to their thickness, much of the wire used for the purpose being 1-200th of an inch in diameter. Her masts, bowsprit, and yards are built up of over 450 pieces, and in the ship and her fittings there are nearly 4000 separate pieces of silver, brazed and screwed and bolted together, including some 200 deadeyes and 180 blocks of various sizes. A very marked feature of the old three-decker was her elaborate stern with its galleries and carved side posts, and these, together with the figure-head, have been accurately modelled from pictures of the ship lent by an officer, who served in her, many of the drawings from which the Britannia herself was constructed, dated 1812, having also aided in the building up of the model, the rigging of which has been done with the assistance of an old blue-jacket.

"On looking at these diminutive men-of-war, it is impossible not to be impressed with the unique character of the gift which the naval services have happily hit upon to record their loyal devotion to Her Majesty on the occasion of her Jubilee year. They represent in a graphic and striking manner the change which fifty years have wrought not only in the size, form, and character of our warships, but in

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almost every detail on board. Glancing from the old to the new type, as represented by the models, we see that the old projecting cutwater, with its figurehead and bowsprit, had disappeared. We miss, too, the high sides with the three tiers of guns peeping out; the fanciful, carved, and ornamented stern, with its galleries, and the three tall masts with their numerous yards and maze of ropes. All this has given place to a ponderous floating mass of iron and steel, moved about by an internal self-contained power equal to that of 12,000 horses, and capable of throwing from one of her guns a shot approaching in weight to the whole broadside of her predecessor of fifty years ago."

Orlando class. Imperieuse class.

In addition to the battle-ships, expenditure was incurred in 1888 on seven belted cruisers, Orlando type, and on the two ships of more powerful type, the Imperieuse and Warspite.

The following is a general description of the Orlando :—

Orlando

Length between perpendiculars, 300 feet; breadth, extreme, 56 feet; depth moulded, 37 feet; displacement 5000 tons at 19 feet draught when in the normal fighting condition. This displacement may be increased to 6000 tons when an extra supply of coal is shipped. The belt which protects the water-line for two-thirds of the length consists of steel-faced compound armour 10 inches thick, strongly supported by steel and teakwood backing, and terminates at each end in an athwart-ship iron bulkhead, 16 inches thick, to stop end-on shot. Level with the top of the armour belt is a protective steel deck, two inches thick on the flat and three inches on the angle where it slopes down below the water-line, and this deck also extends to the stem and stern respectively. All the machinery of vital importance, including the steering gear, air compressors, and electric dynamos, is placed under the protective deck, while above it, for the length of the engine and boiler-rooms, the sides are defended by coal. An armour-plated conning tower on the upper deck is fitted with steering gear and telegraphs, for working the ship when in action. While every precaution is thus taken to keep out shot and shell, the buoyancy in the case of penetration is insured by minute subdivision of the under-water portion of the hull, which contains upwards of 130 separate water-tight cells and compartments. The armament consists of two long-range 22-ton breechloading guns with central pivot mountings on the upper deck, forward and aft respectively; ten 6-inch guns similarly mounted on the broad side; eight 6-pounder, and eight 3-pounder quick-firing guns, also six torpedo tubes.

Protective deck.

Subdivision of hull.

Armament.

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The Admiralty has been severely condemned by Sir Edward Reed for the expenditure of three and a half millions on the Orlando class. The position of the armour belt is the ground of condemnation.

The Admiralty witnesses were closely examined by the Committee on the Navy Estimates as to their opinion of the value of the ships of the Orlando class. Neither Sir Arthur Hood, nor Sir Anthony Hoskins, nor Mr. White, concurred with Sir Edward Reed in attaching a vital importance to the position of the protective belt. The following reply was given to a question put to Sir Arthur Hood :—

Sir Arthur Hood's evidence.

"In your opinion is this vessel, with her altered condition, the armour being under water, still valuable as a fighting vessel?—Most valuable. I may just as well explain to you the reason of the alteration. Although the ship was designed by another Board, naturally the present Board knew everything in connection with her. The real reason of that ship's armour being immersed is this: when the design was prepared by the constructor of that day, and put before the Board of Admiralty of that day to approve or disapprove, the quantity of coal that was shown in that design was 440 tons. The upper edge of the armour was shown as 18 inches above water, consequent upon that amount of coal being on board. But provision was made in the bunkers of that ship for holding 900 tons of coal. Nobody with any common sense, I should have thought, would have designed a ship which was to carry 900 tons of coal, and place her protection of armour as if she was to carry 440 tons. The consequence was, that when the ship was commissioned for foreign service she took 900 tons. That lowered her armour from 18 inches above water to the water's edge. Practically, in my opinion, it makes very little difference, in the actual protection of the ship at sea, whether the edge of the armour is 18 inches above water or not. If a ship was floating on glass it might make a difference, but not under usual conditions at sea."

Sir Anthony Hoskins.

Sir Anthony Hoskins, being closely pressed by Sir Edward Reed, gave a similar opinion.

Mr. White's evidence.

Mr. White's evidence was in the same sense. In reply to the Chairman, he said :—

"My personal opinion about these ships is that the question of the relation of an armour-belt 5½ feet wide to the water surface is not one of the first importance. These vessels, in my judgment, are comparable with vessels which are known as protected vessels. That has always been my opinion. In protected vessels of this size in our own and foreign navies there is no side armour, but the lower

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edge of the deck is from 4 to 5 feet under water when the ships are complete for sea, and the top of the deck is about a foot to 18 inches above water.

"There is a hog-backed steel deck protecting the vitals of the ship?—Yes. These ships, it appears to me, belong to the same category as protected vessels, and always have so belonged.

"So far as the alteration in immersion by 7 inches goes, that is to say, with regard to the armament, and so forth, that has been caused by an absolute improvement of the offensive strength of the vessel?—That is the case. These ships are not made deeper by ballast in their bottom, but by an addition to their live load, to their fighting qualities. As I explained to the Committee, the additions which I have classed under hull and armour are really largely consequent upon the alterations of armament.

"And there has been no sacrifice of speed?—On the contrary, there has been an increase of speed, even with the heavier load of coal, which, after full consideration, the present Board of Admiralty decided should be carried.

"So that your general estimate of these vessels is a high one for the purpose for which they were intended?—It is. I have heard but one opinion from naval officers about these vessels regarded as cruisers, quite irrespective of the technical distinction between armoured and protected ships. That opinion has been without exception favourable.

"But you regard them as properly coming within the category of protected ships, rather than of armoured battle-ships?—They were never reckoned as battle-ships, but they were reckoned as armoured ships, and they were called belted or armoured cruisers. But it appears to me that they are, strictly speaking, to be compared with the cruiser classes which have protection to their vitals. It is a matter of opinion, and a matter of cost, whether that protection is to be obtained by side armour, such as these vessels have, or by a strongly curved deck, such as is given to most of the vessels.

"I rather gather that your personal opinion is that the protection is more economically and better given by a horizontal steel cover than by the side armour?—My personal opinion on this matter has been published again and again. I look upon the use of side armour, in the form of a belt of this narrowness, as not a very wise expenditure of money."

The following table shows the principal points of difference between the Orlando as designed and as completed, and the authority for the variations:—

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Parliamentary return.

	As Designed.	As Completed.	Date of Authority for Additions to the Design, etc.
Orlando as designed and as completed.			
Dimensions, etc. :—	Ft. in.	Ft. in.	
Length between perpendiculars	300 0	300 0	
Breadth, extreme	56 0	56 0	
Load draught of water—			
Forward	19 6	21 0	
Aft	22 6	24 0	
Mean	21 0	22 6	
Displacement, tons	*5,040	*5,535	
Indicated horse-power of engines	†8,500	8,620	
Full speed, knots per hour	18	18½	
Height of armour above load water-line	Ft. in. 1 6	Nil; the upper edge of armour is just level with the water-line.	
Depth of armour below load water-line	4 0	Ft. in. 5 6	
Coals:—			
Complement at above load draught	†440 tons	750 tons	January 1887
Corresponding radius of action at 10 knots	4400 knots	7,000 knots	
Capacity of bunkers in tons	900 tons	900 tons	
Armament	No. in. 2 9·2 (18-ton) guns 10 6 (4½-ton) guns 6 6-pr. quick-firing guns 10 1 (Norden-felt) Boat and field guns Torpedoes	No. in. 2 9·2 (22-ton) guns 10 6 (5-ton) guns 6 6-pr. quick-firing guns 10 3-pr. quick-firing guns Boat, field, and small machine guns Torpedoes	
Complement of officers and men	350	455	March 1886 and November 1887
Weights—			
Water and tanks			
Provisions, with tare			
Officers' stores and slops			
Officers, men, and effects	Tons.	Tons.	
Masts, spars, and rigging	365	394	November 1887
Anchors and cables			
Boats			
Warrant officers' stores			
Guns, carriages, and slides, powder, projectiles, torpedoes, electrical stores, etc.	350	430	Various dates from Sept. 1885

* The displacements are for the ship as laid off.

† The design upon which tenders were invited specified compound engines of 7500 indicated horse-power, with 500 tons of coal, altered in accepting tender to triple-expansion engines with 440 tons of coal.

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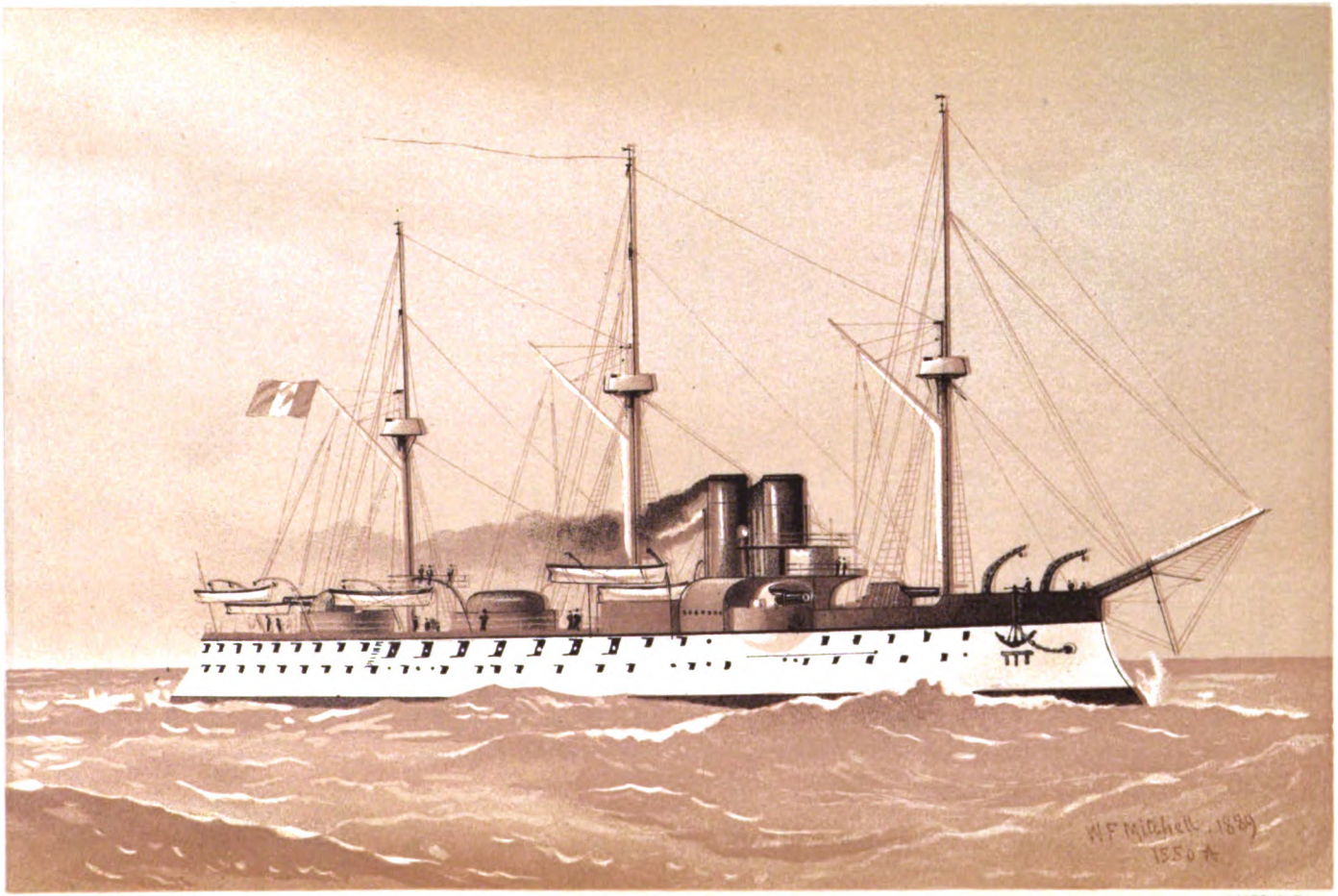

GRIFFIN & Co PORTSMOUTH.

"L'AMIRAL DUPERRÉ."

FR[illegible]TTLE SHIP.

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	As Indicated	As Completed	[illegible]
	[illegible]	[illegible]	
	[illegible]	7.5	
	15	34	October [illegible]
	No electric light in [illegible]	Electric light [illegible]	
	[illegible]	[illegible]	
	[illegible]	70	
	[illegible]	80	
	[illegible]	5	
[illegible]	2 [illegible]	[illegible] 3,010	
[illegible]	[illegible]	[illegible]	

[illegible] weight due to the adoption of central powder [illegible] arrangements, [illegible] crew, [illegible] of armour at [illegible]

[illegible] important [illegible] and [illegible] of [illegible] the following may be specially [illegible] Chaudrer, and [illegible] are to receive triple [illegible] muzzle-loaders of the two [illegible] Piston breech-loading guns. The [illegible] Cape, received a partial breech-loading [illegible] the Hercules is to [illegible] triple [illegible] armament. The Achilles and the Minotaur [illegible] of the old type.

FRANCE.

[illegible] under the name of "Brennus" was [illegible] 1885, but work on her and the sister ship [illegible] at an early stage of construction.

[illegible] of the new Brennus as much as [illegible] hand for the original ship is to be utilised, [illegible] vard on designs that allow for [illegible] explosive shell.

[illegible] include at least three 34-centimetre [illegible] barbette towers, ten 16-centimetre [illegible] The secondary battery is to [illegible] (9-pounder), eight 47-millimetre [illegible] 37-millimetre H. R. C.

[illegible] the speed is to be over 1[illegible] knots. [illegible]

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	As Designed.	As Completed.	Date of Authority for Additions to the Design, etc.
	Tons.	Tons.	
Machinery, propelling . .	800	795	
Engines for electric lighting, capstan, steering torpedoes, etc.	15 No electric light included.	34 Electric light included.	October 1886.
Engineers' stores . . .	45	37	
Coals	440	70	
Conning tower	80	80	
Director tower	—	5	
Hull and armour. . . .	2,945	(a) 3,010	
Total tons. . . .	5,040	5,535	

(a) Includes weight due to the adoption of central powder hoist arrangements, electric lighting, bridge, increased accommodation for largely augmented crew, davits, skid beams, and other fittings for additional boats, and increased thickness of armour at ends of belt.

Repairs and refits of ironclads.

Among the important repairs and refits of ironclads since the last issue of *The Naval Annual*, the following may be specially noted: The Devastation, Thunderer, and Superb are to receive triple-expansion engines. The heavy muzzle-loaders of the two former are to be replaced by 10-inch 29-ton breech-loading guns. The Penelope, before proceeding to the Cape, received a partial breech-loading armament. Of the older ironclads, the Hercules is to receive triple-expansion engines, and a new armament. The Achilles and the Minotaur class are to receive new boilers of the old type.

FRANCE.

Brennus.

The original vessel under the name of "Brennus" was laid down at L'Orient in 1885, but work on her and the sister ship, the Charles Martel, was suspended at an early stage of construction.

In the building of the new Brennus, as much as possible of the material on hand for the original ship is to be utilised; she is to be built at the same yard on designs that allow for protection against melinite and other high explosive shell.

Armament.

The armament is to include at least three 34-centimetre (13·4-inch.) B.L. in turrets or barbette towers, ten 16-centimetre (6·3-inch) B.L. and several torpedo tubes. The secondary battery is to comprise four 65-millimetre (9-pounder), eight 47-millimetre (3-pounder) R. F. G., and eight 37-millimetre H. R. C.

Speed.

With forced draught the speed is to be over 18 knots. The coal

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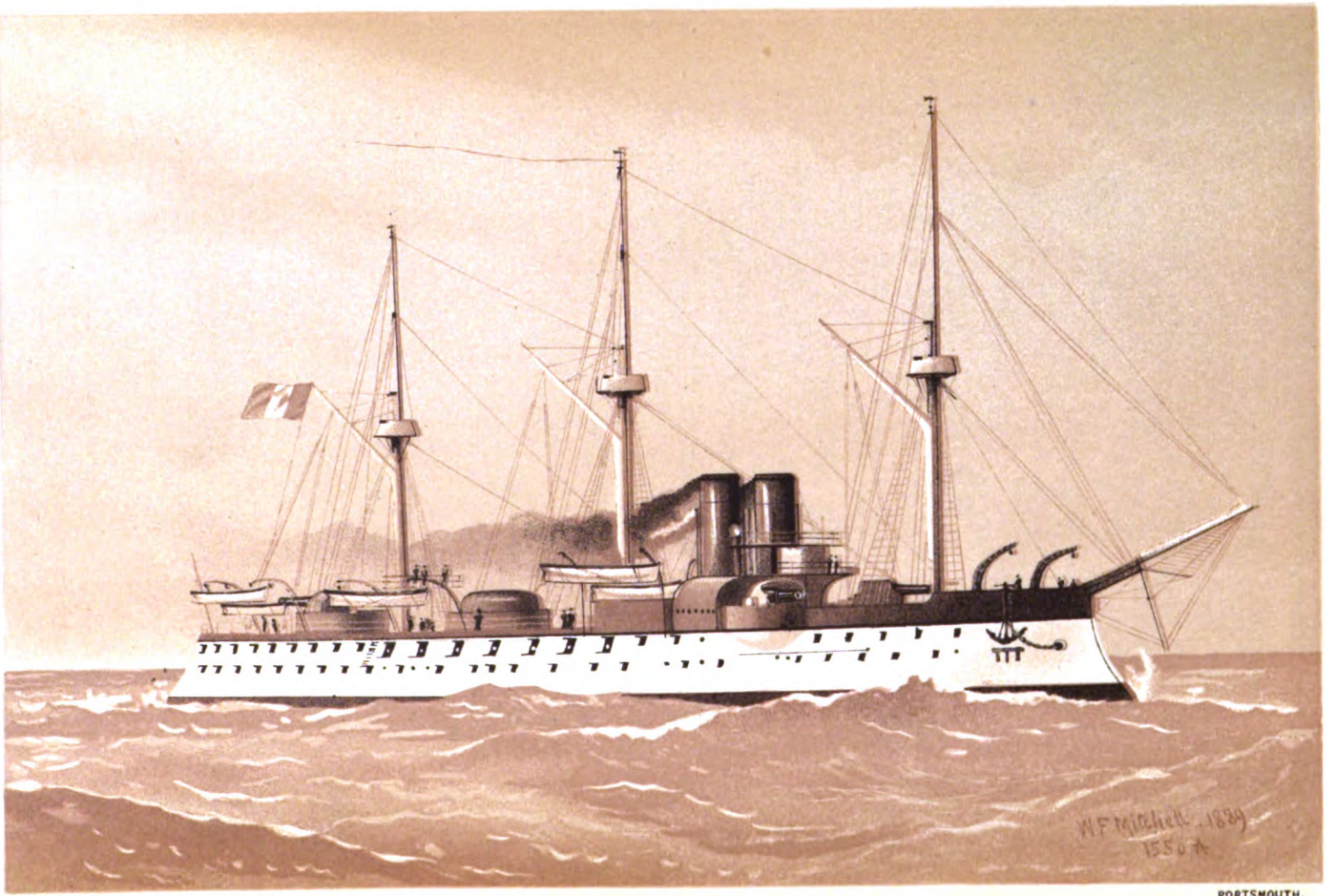

GRIFFIN & Co

PORTSMOUTH.

"L'AMIRAL DUPERRÉ."

FR TTLE SHIP.

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Engines for electric lighting, capstan, steering torpedoes, etc.	15	34	October 1886.
	No electric light included.	Electric light included.	
Engineers' stores . . .	45	37	
Coals	440	70	
Conning tower	80	80	
Director tower	—	5	
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With forced draught the speed is to be over 18 knots. The coal Speed.

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capacity will give an effective radius of 4000 miles at 10-knot speed.

Armour. There will be a complete water-line belt, 6 feet high, of steel or compound armour, 17·7 inches thick amidships, tapering towards ends; the armour on conning tower and turrets or barbette towers is also to be 17·7 inches thick. The 6·3-inch guns will have protection against light guns and shells charged with high explosives.

Protective deck. The armour belt is surmounted by a protective deck with a minimum thickness of 2·33 inches. To further insure the vessel's floating power under fire a complete coffer-dam near water-line is filled with obturating material.

Dupuy de Lôme. The only other ironclad recently laid down which it will be necessary to notice is the Dupuy de Lôme. The original design of this vessel, described as a protected cruiser to be built on plans of M. Thibaudier, has been abandoned.

The present design is by M. de Bussy and is made with the object of furnishing protection against projectiles charged with high

Armament. explosives. The proposed armament is two 19-centimetre (7·48-in.) B. L. on sponsons, one on each side, and six 16-centimetre (6·3-in.) B. L. The arrangement of battery is to be such as to allow a fire of five guns ahead, astern, or abeam. Four torpedo tubes will be fitted. The secondary battery is to comprise two 65-millimetre (9-pounder) and four 47-millimetre (3-pounder) R. F. G., and eight 37-millimetre

Speed and radius of action. H. R. C. A speed of 20 knots is to be realised under forced draught, and 17·5 with natural; triple-expansion engines of 14,000 I.HP. are to drive three screws; the effective radius at 12·5 knots speed is estimated at 4000 miles.

The Dupuy de Lôme is to be built at Brest, entirely of steel; she is to have a complete armour belt of 10-centimetre (3·94-in.) maximum thickness amidships and side armour of same thickness in wake of the battery. A complete protective deck is to be fitted, and below it a splinter deck over vital parts. Above the protective deck is a coffer-dam or belt of cellulose or other obturating material, 1 metre (3·28 feet) high. There will be thirteen principal, and a large number

Dimensions. of small, water-tight compartments. The principal dimensions are to be: Length, 376 feet; beam, 51½ feet; and displacement, 6297

Complement. tons, at a mean draught of 23 feet 3 inches. The complement to be

Estimated cost. about 400 officers and men. It is intended to complete the vessel in three years and a half, at an estimated cost of about £700,000.

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Dimensions.

Complement.

Estimated cost.

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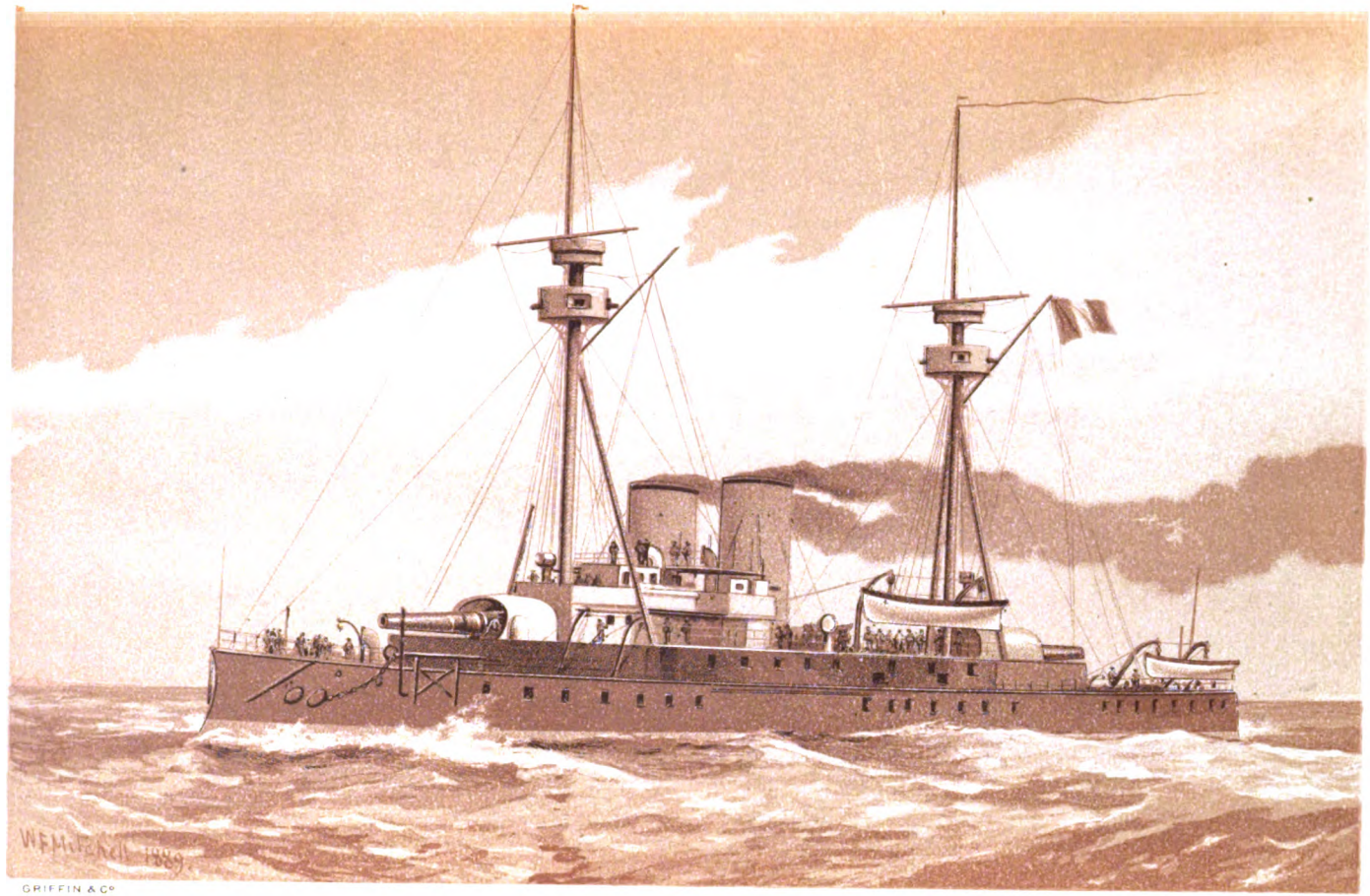

GRIFFIN & Co

PORTSMOUTH

"CAIMAN."

FRENCH BATTLE SHIP

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[illegible] of [illegible] [illegible]

[illegible] 1.7 [illegible]

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[illegible] insure [illegible]

[illegible] near water-line is [illegible]

[illegible] recently laid down [illegible] [illegible] the Tripoy de Lôme. The [illegible] [illegible] protected cruiser to be built on plans of [illegible]

[illegible] is by M. de Bussy and is made with [illegible] protection against projectiles [illegible] with [illegible] [illegible] armament is two 19-centimetre (7.4 [illegible] each side, and six 16 centimetre [illegible] [illegible] of battery is to be such as to allow [illegible] [illegible] or abeam. Four torpedo tubes will be [illegible] The secondary [illegible] to consist of two 65-millimetre (2.56 [illegible] and four 47-millimetre (3-pounder) R. F. C. and eight 37 millimetre H. R. C. A speed of 20 knots is to be realised under forced [illegible] and 17.5 with natural; triple-expansion engines of 14,000 I.H.P. [illegible] [illegible] screws; the effective radius at 12.5 knots speed [illegible] [illegible] miles.

Speed and radius of action.

[illegible] built at [illegible] entirely of [illegible] [illegible] belt of 10-centimetre (3.94-in.) [illegible] [illegible] and side [illegible] of same thickness in [illegible] [illegible] A complete protective deck is to be fitted, and below [illegible] over [illegible] [illegible] Above the [illegible] [illegible] belt of cellulose or other obturating material, [illegible] [illegible] There will be thirteen principal, and a large [illegible] of [illegible] compartments. The principal dimensions [illegible] to be: Length [illegible] feet; and displacement [illegible] tons, at a mean draught of [illegible] feet 3 inches. The complement [illegible] [illegible] officers and [illegible] It is intended to complete the [illegible] [illegible] and a half, [illegible] estimated cost of about £270,000.

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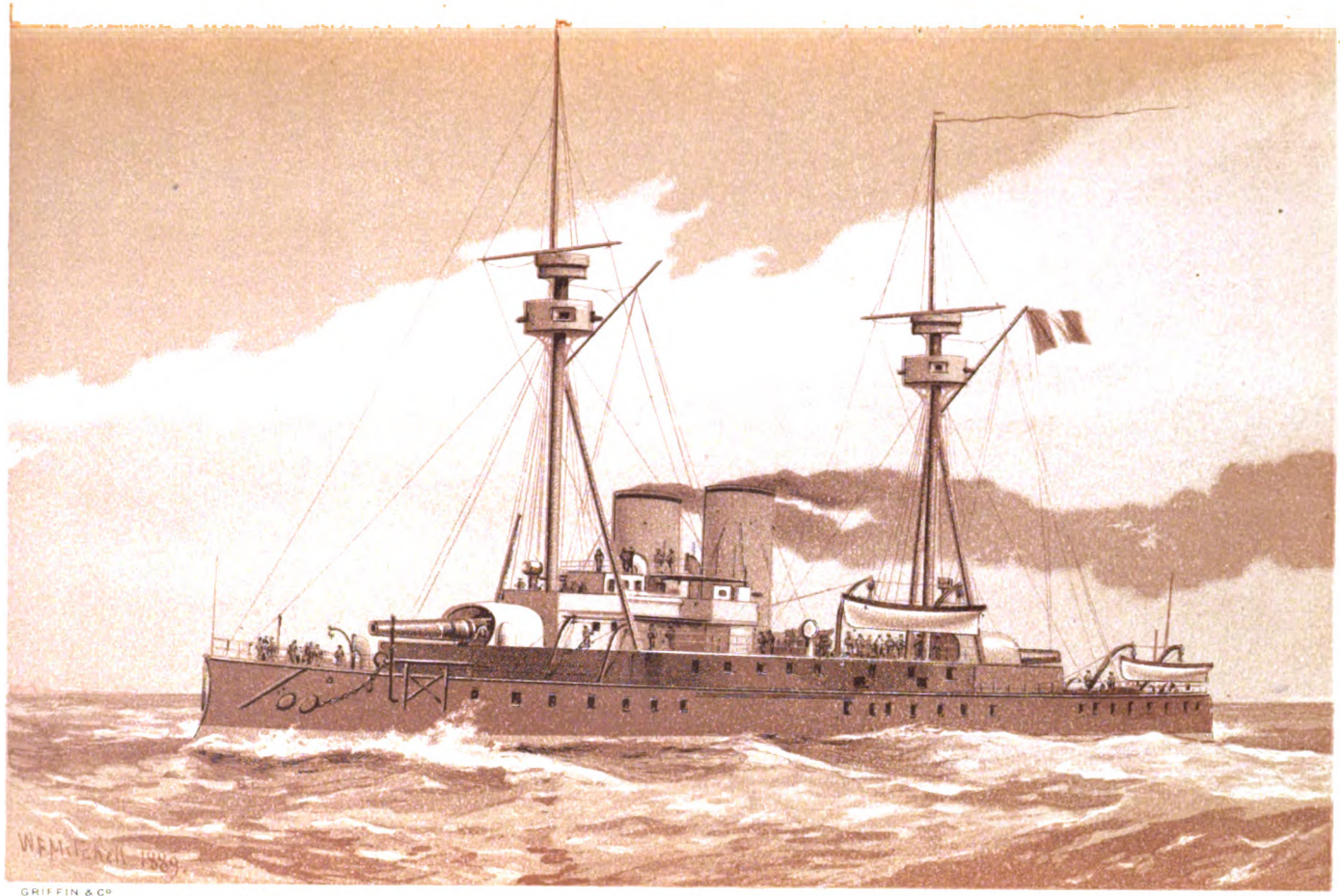

GRIFFIN & Co PORTSMOUTH

"CAIMAN."
FRENCH BATTLE SHIP

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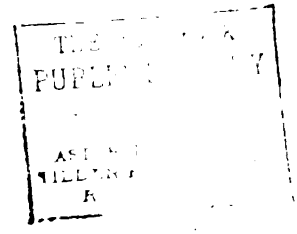
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Italy.

It will not be necessary to describe in detail the types in construction for the Italian navy. While their ironclads exceed in dimensions those of any other power, the Italian constructors have not hesitated to throw off side armour altogether.

Sicilia. Sardegna.

The most important ships now on the stocks in Italy are the Sicilia and the Sardegna, displacement 13,298 tons, speed 18 knots, armament four 13·4 inch breech-loading guns, in addition to which numerous quick-firing guns will be carried.

The protected cruisers, with a powerful turret armament and high speed, are a prominent feature in the shipbuilding of Italy at the present time.

Fieramosca type. Dogali type.

The constructors are about to commence three vessels of the Fieramosca type, 3745 tons, 17 knots, and four of the Dogali type, 2017 tons, 19·6 knots, armament six 5·9-inch breech-loading, and nine 6-pounder quick-firing guns. The ships will be protected by an armoured deck of 2½-inch iron plates.

Re Umberto.

In the history of shipbuilding for the Italian navy, the trials of the Lepanto, and the launching of the Re Umberto are the most important incidents of the year 1888.

The characteristic features of the designs for the Lepanto were described in *Engineering*:—

Italia. Lepanto.

"The Italia and her sister ship, the Lepanto, were commenced about ten years ago, the one being built at Castellamare, on the Bay of Naples, and the other at Leghorn. They inaugurated the bold step in advance which Italy took when she decided to build sixteen battleships of the first class, ten of the second class, and twenty cruisers. In these two mammoth vessels the external armour is placed on a citadel 107 feet in length and about 6 feet deep. This central distance of 107 feet is the only part of the ship's side which is protected by vertical exterior armour."

Length of citadel.

The estimated weights of the hull, armour, &c., are given approximately as follows:—

"Hull, 5000 tons; armour—of armoured deck, 1200; of citadel, 900; of ammunition shaft, 246; of chimneys, 552; total weight of armour, 2898 tons; teak backing, 114; the total weight of the machinery is about 2200 tons."

The following are some of the particulars of the Italia and Lepanto:

Dimensions.

"Length between perpendiculars, 400½ feet; breadth of beam at water-line, 73¾ feet; upper deck, 65½ feet; draught of water—forward, 26½ feet; aft, 30½ feet; mean, 28 feet; area of immersed midship

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section, 1770 square feet; displacement at load draught, 13,480 tons; length of armoured tower, 96 feet; breadth, 72½ feet; distance of stem from armoured tower, 170 feet; thickness of side of tower, including armour, 3½ feet; thickness of armour on tower, 21 inches; on breastwork, 18 inches; height of centre of heavy guns above water-line, 32 feet 8 inches; height of top of tower above water line, 30 feet; height of upper deck above water-line, forward, 25 feet; aft, 23 feet; amidships, 22½ feet; height between decks, 7 feet 9 inches and 7 feet 6 inches; depth of lower deck below water-line amidships at sides, 5½ feet; depth of hold under lower deck, 21 feet; extension of ram beyond forward perpendicular, 6 feet 4 inches; distance of point of ram below water-line, 8 feet 6 inches.

Armour.

Armament.

"The armament consists of four 43-cm. (100-ton) B. L. R. guns supplied by Armstrong. There are eight 15-cm. (6-inch) Armstrong breechloaders. Six of these are carried on the upper deck, two being respectively bow and stern chasers. There are six smaller quick-firing guns of 57 mm. calibre. There are machine guns, comprising twenty-two Hotchkiss and quick-firing guns for the boats and landing parties. There will also be a number of Maxim guns.

"There are four torpedo ports arranged on the broadside, two ahead and two astern.

Barbettes.

"The barbettes are placed *en échelon*, and each one carries two of the monster 100-ton guns. They are contained in an armoured casemate, which is supported by the unarmoured structure of the ship. The space thus enclosed is entered from below through an armoured shaft, which leads below water to the space between the forward and after sets of engines, and serves as an ammunition shaft.

Funnel bases.

The bases of the chimneys in each group are also protected by armoured belts. The plated deck which completes the armoured protection extends from stem to stern, the armour being of steel and 3 inches thick. The midship section of the ship (*Pl.* **102**) shows this deck in a uniform curve extending from side to side. Where it springs from the skin of the vessel it is about 5 feet 6 inches below water-line, and at its highest part it is about 1 foot 6 inches below the level of the water in the design, and probably somewhat more in the completed ship, which has gained weight in building. In the succeeding ships, Re Umberto, Sicilia, and Sardegna, the crown of the deck has been raised considerably above the water-level. Steel is largely used in their construction.

Subdivision of the hull.

There are two longitudinal water-tight bulkheads, extending fore and aft for 254 feet. Altogether the hull is divided into fifty-three vertical divisions, these being split up again horizontally by the four decks.

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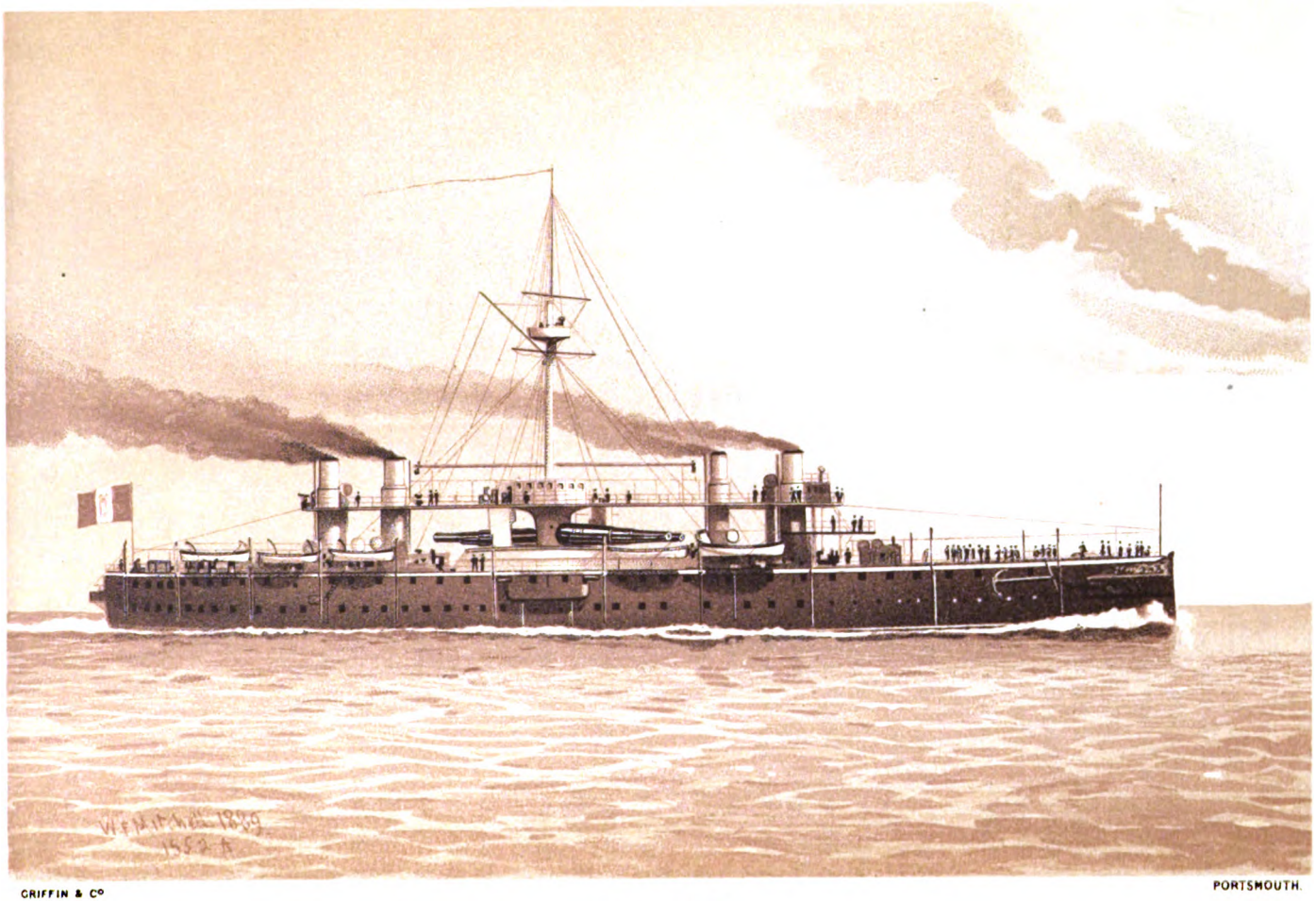

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"LEPANTO".
ITALIAN BATTLE SHIP.

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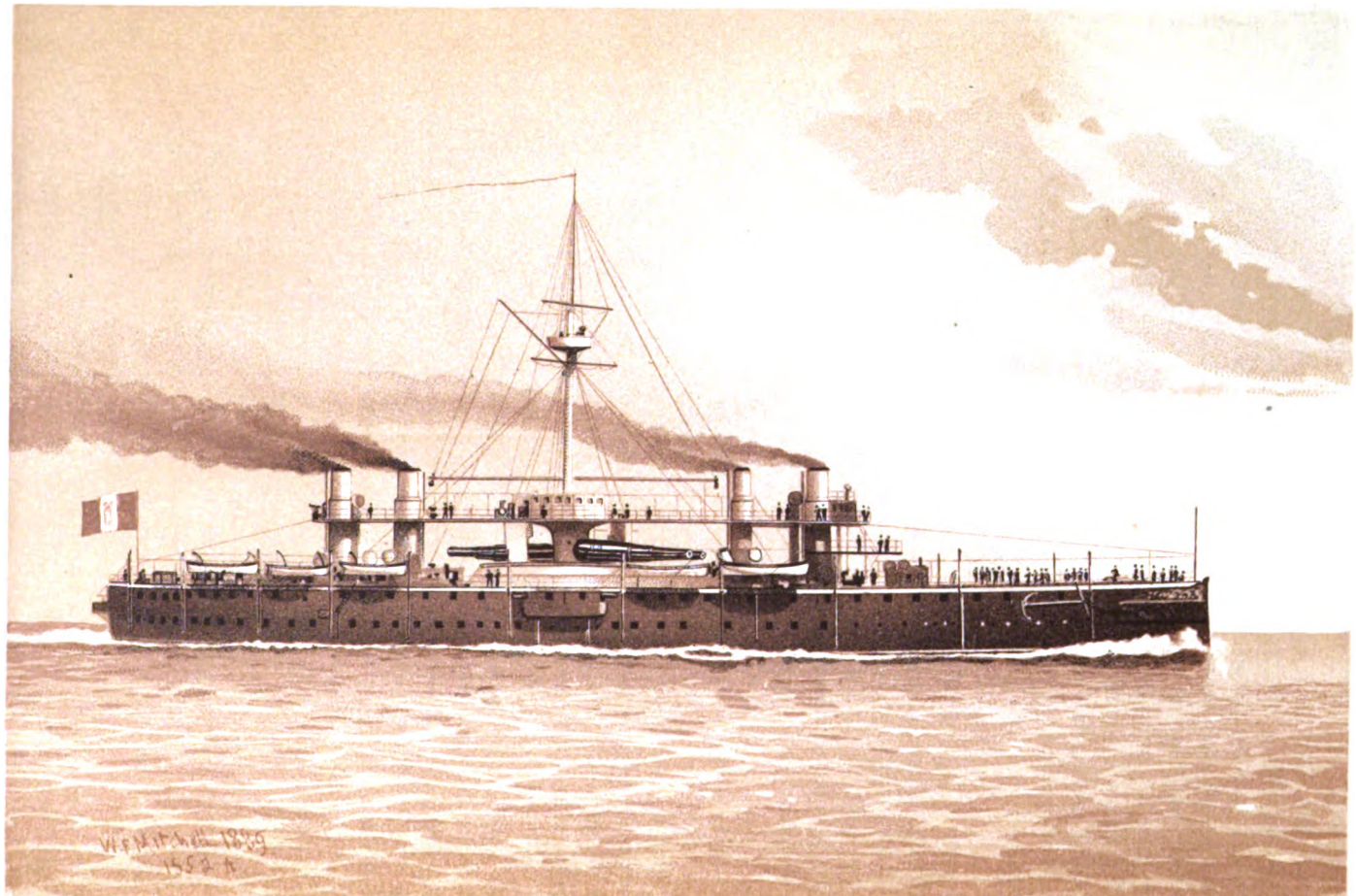

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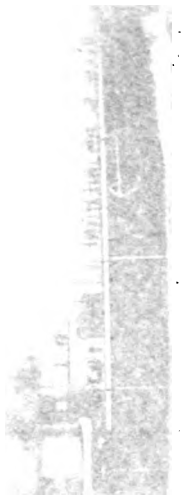

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Cork stuffing is extensively used in the side compartments. Six feet above the water-line is a deck of ordinary plating covered with wood; and above this is the battery deck, having a height of 14 feet above the water-line. Again, 7 feet 9 inches above this is the upper deck, which supports the casemate containing the big guns mounted *en barbette*.

"The great height above the water at which the Italia carries her guns is a very strong point in favour of her design, such an element being to a warship of the present day, when armoured decks form so important an element of defence, very much what length of reach is to a boxer. High speed is another, and perhaps the most important advantage that was aimed at as a counter-balancing advantage in dispensing with side armour. The under-water shape of the Italia is very beautiful, and in looking at her model one is forcibly reminded of a remark of our present Director of Naval Construction, Mr. W. H. White, that, however unsightly modern warships are to view afloat, some of the most beautiful forms ever produced by the naval architect are hidden from sight below the water-line of the ungainly superstructures. It was hoped that the Italia would steam 18 knots, and this was all but got on her trial, the speed we believe that was registered being, as stated, 17·8 knots. The power developed by the engines was considerably short of the contract. It was expected to get 18,000 indicated HP.

Speed in trial.

"The two sets of engines for driving each of the Italia's twin-screws have each three cylinders of equal size arranged in line on the shafting. At full speed they all take steam direct from the boiler, but in ordinary working the foremost cylinder of each set alone takes steam from the boiler, and exhausts into the other two cylinders. There are thus six cylinders to each propeller. The engines are placed amidships, the boilers being placed fourteen before and twelve abaft them. The shafting runs under the after boilers. It is the unusual arrangement of the boilers which gives the vessel the somewhat peculiar appearance due to the position of the six chimneys."

Propelling machinery.

The trials of the sister ship Lepanto, in April and May last, were the subject of an able article by M. Lisbonne, a French naval constructor, published in *Le Yacht* of September 8th, 1888.

Lepanto.

The results of an extended series of trials are given in the following table:—

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Date of Trial.	April 4, 1888.	April 7, 1888.	April 11, 1888.	April 14, 1888.	April 28, 1888.	April 28, 1888.	May 5, 1888.	May 12, 1888.
	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.
Mean draught of water	30 4	30 4	30 3	30 3	30 1	30 0	30 3	30 4
Displacement in tons	14,860	14,860	14,810	14,810	14,740	14,690	14,810	14,860
Indicated horse-power	1,004	6,230	5,714	7,385	10,330	12,010	15,260	16,150
Number of boilers used	2 oval	8 oval	8 oval	4 oval 8 locomotive	8 oval 8 locomotive	8 oval 8 locomotive	8 oval 16 locomotive	8 oval 16 locomotive
Number of engines used . . .	2 comp.	4 comp.	4 direct	2 direct	4 direct	4 direct	4 direct	4 direct
Number of revolutions per minute.	38·8	70·5	68·7	74·2	81·0	85·0	92·0	93·5
Mean speed in knots	7·25	10·7	13·3	14·4	15·89	16·78	18·18	18·38
Consumption of coal per hour — Tons . . .	0·9	6·4	6·9	11·4	13·7	16·0	21·8	23·5
Consumption of coal per hour — lb. per I.HP. .	2·02	2·26	2·74	3·44	2·97	3·14	3·10	3·30
Slip per cent..	6·4	4·25	4·60	3·8	2·7	1·8	2·34	2·72

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The description of the Re Umberto is taken from the *Engineer* of November 2nd, 1888:—

Re Umberto.

"The Re Umberto, launched at Castellamare in the presence of the Emperor William and King Humbert, is a steel twin-screw, deck-protected barbette ship of 13,298 tons displacement. The Re Umberto is nearly as large as the Italia, which was launched also at Castellamare in 1880, and the Lepanto, which was launched at Leghorn in 1882. As far as beam alone is concerned she is bigger than either of those leviathans; and in this respect there is nothing afloat that can rival her.

Dimensions.

Her dimensions are:—Length, 400 ft. 4 in.; breadth, 76 ft. 9 in.; and her mean draught of water with all her weights on board is expected to be 28 ft. 8 in.

No side armour.

She has no side armour at the water-line. A large amount of protection is, however, afforded to her by the construction of her bottom and sides, by the subdivision of her hull into a great number of water-tight compartments, and by a curved steel deck near the water-line.

Two double bottoms.

The ship's bottom is composed of three skins, which form two water-tight spaces that are further subdivided transversely.

Experiment at Spezzia.

Experiments to test this mode of construction were made several years ago in Spezzia harbour. A caisson, built up in a similar way, was moored, and a charge of 75 lb. of gun-cotton was exploded in contact with it, and at suitable depth. The two outer skins were ruptured, but the inner skin remained intact. Subsequently the inner one of the two spaces was filled with coal, and the experiment was repeated. This time only the outer skin was shattered. It may therefore be taken as proved that the construction of the Re Umberto affords protection against a considerable torpedo charge.

The armoured deck leaves the ship's side 6 ft. below the water-line, and curves upwards, until, along the middle line of the ship, it is but 2 ft. below the water-line. It is formed by a $\frac{5}{8}$-in. steel plate, overlaid by a $2\frac{3}{8}$-in. compound plate. Below this deck and between it and the ship's bottom there are over fifty water-tight compartments. Between the armoured deck and the deck immediately above it there are 100 other water-tight compartments. If, therefore, water were to enter the ship either above or below the protective deck, its volume and evil effects might, with proper precaution, be strictly limited.

Barbettes.

The chief part of the armament will be carried in two barbettes, one forward and the other aft, on the middle line of the vessel. Each of these barbettes will be plated with compound armour 18 in. in thickness, placed at an angle of 24 deg. from the vertical. The ammunition hoists between the armoured deck and the barbettes will also be armoured, and the bases of the funnels will have substantial protection to a height of over 3 ft. above the water-line. Beyond this the vessel will have no armour.

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Propelling machinery.

"The engines above mentioned have been built by Messrs. Maudslay, Sons, and Field, London. They are of the compound type, and are splendid specimens of marine engines; but it must be remembered that they were designed as far back as 1884. The following are the leading particulars of the engines of the Re Umberto, viz.:—Four sets of compound engines, two sets being applied to work each screw propeller, each set having one high-pressure cylinder 47 in. diameter, and one low-pressure cylinder 89 in. diameter, with a stroke of 4 ft. 8 in., making about 100 revolutions per minute; diameter of screw propellers, 20 ft. Eighteen main boilers, 14 ft. 3 in. diameter, 9 ft. 6 in. long, having altogether seventy-two furnaces, 3 ft. 2 in. diameter, 6 ft. 4 in. long, with an aggregate area of grate surface of 1444 square feet, and a total heating surface of 40,230 square feet. The working pressure of the steam is 100 lb., and the indicated horse-power 19,500. It is expected that these engines will drive the ship at an extreme speed of 18 knots. The coal capacity of the vessel is 1200 tons.

Boilers.

Speed.

Armament.

"The armament of the Re Umberto, in addition to a ram, will comprise four 17-in. new model 104-ton Armstrong breechloaders, two being mounted in each barbette: twelve 6-in. Armstrong 4½-ton breechloaders, carried in the batteries; six 3-in. guns, and ten machine and quick-firing guns, together with torpedoes. The so-called 104-ton gun—that is not its exact weight—has a total length of 40 ft. 9 in., the length of the rifled bore being 28 ft. 10⅔ in., and of the powder chamber 7 ft. 6 in. The number of grooves in the rifling is eighty, and they have a twist of 1 in 50 calibres, or, in other words, of one revolution in 70 ft. 10 in. The full firing charge for the armour-piercing projectile is 900 lb. of progressive Fossano powder; for common shell it is 600 lb. The projectiles weigh 2000 lb. each. The bursting charge of the armour-piercing projectile is 32 lb.; of the common shell, 60 lb.; and of the shrapnel, 5 lb. The muzzle velocity of the gun, when fired with the full charge, is 1992 ft. per second. The muzzle energy is 55,030 foot-tons—sufficient to raise the Re Umberto, guns and all, more than 4 ft. out of the water; and the projectile at the muzzle of the gun is capable of perforating 33½ in. of wrought iron. These heavy guns will be carried at a height of 28 ft. above the surface of the water."

Height of gun above water.

The Re Umberto is to be completed for sea in 1892. Her design, which is also that of her sister ships, the Sicilia and the Sardegna, and of her kindred, the Italia and the Lepanto, has excited much criticism, and many competent judges have not hesitated to express an opinion that in the line of battle a vessel of this description would be dangerously out of place. Yet, if the Re Umberto is not useful as

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a battle-ship, it is hard to see what she can be useful for. The *Times* says that, writing in the August number of the *Jahrbücher für die Deutsche Armee und Marine*, Herr Spiridion Gopcevic denies her utility altogether. She is, he declares, neither a battle-ship nor a cruiser. She is not a battle-ship for the reason that her sides are entirely unarmoured. She is not a cruiser for the reason that she does not carry sufficient coal. She is, moreover, too costly to be risked on cruiser's work. For the cost of a single Italia or Re Umberto, four ironclads, each of about 3500 tons, might, he thinks, be built. Their united strength in artillery might equal that of the big ship; and, if that were so, they would, he maintains, be together much more than a match for the monster. There would be four vessels—that is, four rams against one; and it is hard to believe that, even if she were successful in one or two cases, the large vessel would put out of action or sink all her opponents before being herself sunk. Nay, more, the single ship, in this comparison, labours under the considerable disadvantage of being unable to divide herself and to be in four places at once. She is the less able, therefore, to enforce a blockade. Her draught of water debars her from many ports and waters, her size from many docks. She takes four times as long as a small vessel to build. Whenever she is under repair, a fourfold strength is doomed to lie idle. Herr Gopcevic urges all this, and much more, against huge unarmoured ships; and doubtless Italy has run some risk in investing so much money in them as she has invested during the last twelve years. Her navy is not, and never can be, strong enough to theoretically justify her in putting more than comparatively few eggs into one basket. Nevertheless, the Re Umberto, for offensive purposes at least, deserves to be called a most formidable ship, if only because she will when completed throw a heavier weight of shot than any ship that has yet been built. Including all guns of 6 inches calibre and over, the gun-strength of the most heavily armed battle-ships of the naval Powers is as follows:—

A German opinion of the ships of Italia type.

	Weight of Discharge.	Muzzle energy of Discharge.
Re Umberto (Italian)	8960 lb.	236,896 foot-tons
Amiral Baudin (French)	5950 „	124,770 „
Victoria (British)	5176 „	132,632 „
Deutschland (German)	3864 „	66,530 „
Tchesme (Russian).	4988 „	123,772 „
Krp. Rudolf (Austrian)	3000 „	57,000 „

This comparison, even if no other elements be taken, is sufficient to

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show that, whatever may be the weaknesses and demerits of the Re Umberto, she is a very dangerous adversary and a very remarkable ship.

GERMANY.

The new programme of naval construction for the German Navy is set forth in the following article reprinted from the *Times* of October 15th, 1888 :—

New German programme.

"Five years ago General von Caprivi succeeded General von Stosch as Chief of the German Admiralty. Von Stosch had held the office for eleven years, and to him and his predecessor, Admiral Prince Adalbert of Prussia, belong the distinction of having created the fleet of modern Germany. The mission of Von Caprivi was to provide that fleet with capable officers and men, and to give it a thorough organization. It cannot be denied that during his tenure of office he carried out his task in such a way as to produce very remarkable results. At this moment there is no navy which is better officered or better manned than the German. The officers are, almost without exception, men of high scientific attainments, first-rate seamen, and magnificent disciplinarians. The men are models of smartness, and, although the majority of them are inland born, they are in all respects as good sailors as our own bluejackets. No one who has seen anything of work as it is performed in British and German men-of-war can doubt this. Indeed, in the matter of smartness, an unprejudiced critic would probably award the superiority to the German tars. Nor in his efforts to organize the Imperial Navy was Von Caprivi less conspicuously successful. He introduced a system which enables Germany to commission her ships with greater promptitude than any other Power. He formed the Training Squadron, which, as a practical school for seamen, has no rival save our own training squadron. He created the Cruising Squadron, which rendered it possible for Germany to dream of founding a colonial empire. Finally, he raised the German fleet to such a wonderful pitch of effectiveness that during this summer's manœuvres, although a considerable number of ships of all kinds were engaged in operations for a period of nearly four months, there was not a single breakdown of any kind. When we recollect how numerous were the mishaps in the British and French Evolutionary Squadrons of the present year, this absolute immunity of the German vessels from disaster becomes very significant.

Naval officers.

Seamen.

Training Squadron.

Cruising Squadron.

"But Von Caprivi did not confine himself to organizing what his

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predecessors had provided. He completed the construction of Germany's torpedo flotilla, which is now, perhaps, as formidable as any in the world; and he caused several fast cruisers to be laid down. Had he been permitted, he would have gone much further in this direction, for he is known to be a strong advocate of the value of good cruisers, and even to prefer them generally for Germany's purposes to battle-ships. His retirement, in July last, was, indirectly at least, caused by the steadfastness with which he maintained these opinions. It is no secret that what may be called the new race of German naval officers does not altogether agree with them. The new generation, while recognizing the usefulness of fast unarmoured vessels, believes that Germany is forced, by the recent developments of her colonial policy, as well as by her position in Europe, so to strengthen her hand that she may be able to meet at sea the fleet of any Power which is not of the first class. She cannot, the new generation admits, think of competing with Great Britain or with France as a naval Power; but it is her business not only to compete with, but also to be superior to, Italy, Russia, Austria, or Spain, and she can only effect her object by adding to the number of her battle-ships, and by replacing with modern vessels those of her ironclads which are obsolete. Chief among the supporters of this view are Vice-Admiral Count Von Monts, Prince Henry of Prussia, and the Emperor himself. It was therefore natural that with the accession of William II., the reign of General von Caprivi at the Admiralty should terminate, and it was almost equally natural that at the same time the reign of Count von Monts should begin.

Torpedo flotilla and fast cruisers.

"The Emperor William II. is a seaman as well as a soldier. In former years, visitors to Potsdam often saw him sailing the model frigate Royal Louise, which was presented to his great-grandfather by our William IV., and which is the sister ship to the Royal Adelaide, Her Majesty's yacht at Virginia Water. But the young Prince did not gain his sole nautical experience on the waters of the Havel. Before his accession he was very often at Kiel; he yachted both there and in the North Sea, and he neglected no opportunity of studying naval affairs. He has always declared that the German Navy must not be a merely defensive or a merely secondary force in the Imperial armaments, and that the Empire should be able in case of need to pursue a strong policy at sea. One of his first acts after his accession was to receive and closely question the Chief Constructor of his navy; he has since had numerous conferences on naval matters with his brother Prince Henry, with Count von Monts, and with several distinguished flag officers; and, having listened to opinions of all

The Emperor a seaman.

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shades, he has determined that there shall be a practical reconstruction of the German Navy. The Reichstag when it reassembles will be invited to consider the question, and in the meantime the outlines of the scheme which will be laid before the country have been decided upon by the experts at the Admiralty. These outlines may, and probably will, be modified before the scheme is finally adopted. Even in Germany the taxpayer and political parties are forces that have to be reckoned with; but there are signs that the Government does not intend to permit its plans to be interfered with to any considerable extent. Count von Monts will ask the country, among other things, to enable him to increase the navy by nine or ten new ironclads and twelve ironclad gunboats; he will suggest, in addition, that an ironclad to replace the Grosser Kurfürst should be laid down; he will advocate the construction of three ironclads to take the places of the obsolete Hansa, Friedrich Karl, and Kronprinz; and on these and other improvements he will propose to expend a sum of 200,000,000 marks (£10,000,000). At the present time the German navy includes fourteen battle-ships, thirteen of which are afloat, one being under construction at the Germania Werft. Of the thirteen which are afloat, two—Friedrich der Grosse and Preussen—are turret ships; five—Baden, Bayern, Oldenburg, Sachsen, and Württemberg—are barbette ships; three—Deutschland, Hansa, and Kaiser—are central battery ships; and three—Friedrich Karl, König Wilhelm, and Kronprinz—are broadside ships. One of these, the Hansa, has been already removed from the navy list; two others—the Friedrich Karl and the Kronprinz—must, in the ordinary course of events, be also removed as soon as, if not before, any ironclads can be built to take their places. The remaining battle-ships are as follows:—

Increase for Navy proposed.

Present strength.

Name.	Date of launch.	Displacement in tons.	Ind. horse-power.	Armament.
König Wilhelm . . .	1868	9600	8000	18-9¾ in. 14 t.; 4-8¼ in. 12 t.; 7-6¼ in. 4 t.
Preussen	1873	6660	5400	4-10¾ in. 18 t.; 2-6¾ in. 6 t.
Deutschland	1874	7550	8000	8-10¼ in. 23 t.; 1-6 in. 4 t.; 6-6 in. 3½ t.
Friedrich der Grosse . .	1874	6660	5400	4-10¾ in. 18 t.; 2-6¾ in. 6 t.
Kaiser	1874	7550	8000	8-10¼ in. 23 t.; 1-6 in. 4 t.; 6-6 in. 3½ t.
Sachsen.	1877	7280	5600	6-10¼ in. 18 t.
Württemberg	1878	7280	5600	6-10¼ in. 18 t.
Bayern	1878	7280	5600	6-10¼ in. 18 t.
Baden	1880	7280	5600	6-10¼ in. 18 t.
Oldenburg	1884	5170	3900	8-9¾ in. 14 t.; 4-6 in. 4 t.

"The majority of German naval critics are dissatisfied to a greater

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or less extent with all these vessels, the König Wilhelm, Kaiser, Deutschland, and Oldenburg only excepted. The four ships of the Sachsen type are regarded as weak, because of the fact that their ends, like those of all our modern battle-ships, have only deck protection. No more vessels of that kind are to be built. The new ships are to be craft of between 3000 and 4000 tons displacement, with a complete armoured belt at the water-line, with considerable speed, with their heavy armament in an armoured central battery, and with a few powerful guns rather than with a number of comparatively light ones. It is a ship of this kind that has already been laid down at the Germania yard. Five similar vessels are, in accordance with the Admiralty scheme, to be laid down almost immediately, and four more at a later date, making ten in all. It does not appear that the details of the ships with which it is proposed to replace the Grosser Kurfürst, the Kronprinz, the Hansa, and the Friedrich Karl have yet been definitely decided upon; and it is likely that this portion of the general scheme is considered to be of somewhat less importance than the other. But that part of the project which concerns the building of ironclad gun-vessels is quite certain to be uncompromisingly pushed forward. Germany already possesses twelve of these ships, eleven being of one type, with 1090 tons displacement, and carrying a single 12-in. 37-ton gun. Twelve more, of a somewhat larger size, are declared to be called for in order that the defence of the mouths of the North Sea and Baltic Ship Canal may be properly assured.

Type of ship proposed.

One already laid down.

"This great work, which was formally begun on June 3, 1887, is, indeed, so intimately connected with all the contemplated changes in the German navy that, only after considering what it will be and what it will ultimately effect, can one realize how enormously Germany's strength at sea will be increased within the next ten years. The canal will run from Holtenau, in the Gulf of Kiel, south-westward by way of Rendsburg, to a point nearly mid-way between Brunsbüttel and St. Margarethen, on the north shore of the Elbe below Hamburg. Its length will be 61 miles, its breadth at the surface of the water 196 feet, and at the bottom 84 feet, and its depth 27 feet. Any German battle-ship will be able to pass through it at all states of the tide; there will only be a single lock at each end, and the passage will be easily accomplished in six or seven hours. When, therefore, the canal is finished, as it will be in seven years' time, the sealing up of the Baltic by a hostile fleet will become a matter of comparative indifference to Germany. She will still have an outlet from all her northern ports into the North Sea by way of

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the Elbe. The northern mouth of the canal is already sufficiently protected by the forts at Kiel and Friedrichsort. To protect the southern mouth, it has been decided to form a second-class naval station at Burnsbüttel and to fortify it. Ten of the new ironclad gun-vessels are to be stationed there; barracks, store-houses, and dry docks are to be built there; and it is expected that in less than ten years the mouth of the Elbe will be rendered impregnable, as Kiel and Wilhelmshaven are already declared to be. In the meanwhile Dantsic is to be transformed into another second-class naval station, in order to act as a counterweight to Libau, which Russia has recently fortified. Germany will then possess a first and a second-class naval port in the Baltic as well as in the North Sea. The completed canal will enable Kiel, Brunsbüttel, and Dantsic to support one another so long as Germany retains command of Holstein and her Baltic coasts; but Wilhelmshaven will still remain liable to be isolated in war time. While Great Britain holds the island of Heligoland, which in this connection the Germans call a *Nasenklemmer*, or nose-pincher, she would be able in case of need to blockade the mouth of the Elbe and the entrance to the Jade, on which Wilhelmshaven is situated. Should she do so, she would, of course, put a stop to communication by water between Wilhelmshaven and the three other German naval ports. She would prevent the concentration of the ships in the North Sea ports, and inability to concentrate might be fatal to Germany. It is proposed, therefore, after the completion of the canal as at present designed, to continue it from the Elbe across Northern Hanover to the Jade. Battle-ships would then be able to pass unhindered from Kiel to Wilhelmshaven, or *vice versâ*, without going to sea at all; and intercommunication by water between all the German naval ports might be maintained even if a foreign Power held absolute command of the German Ocean.

Estimated cost.

"The estimated cost of the twelve new gun-vessels is about £160,000 a piece, or about £2,000,000 in all. The ten new battle-ships will not absorb the whole of the remaining part of the sum which it is proposed to devote to the reconstruction of the navy. They are not expected to cost more than £400,000 each, and, should they cost no more, a sum of £4,000,000 will be available for replacing the Grosser Kurfürst, the Hansa, the Kronprinz, and the Friedrich Karl, for the building of works at Brunsbüttel, for adding to the torpedo-boat flotilla, and for the carrying out of minor improvements which are contemplated.

"It is further proposed to reorganize as well as to reconstruct the German fleet. Its organization, especially as regards administrative

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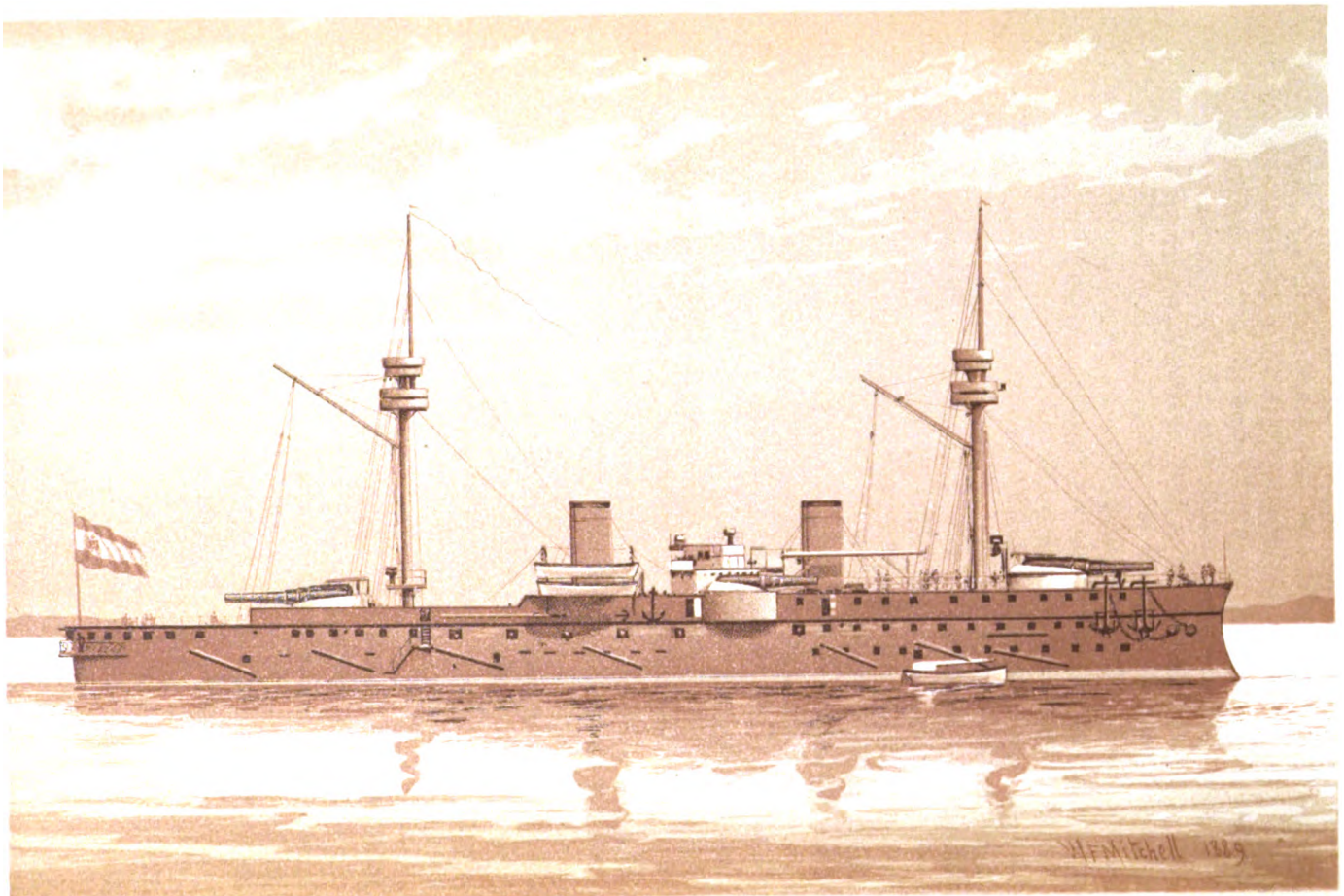

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"PELAYO."

SPANISH BATTLE SHIP

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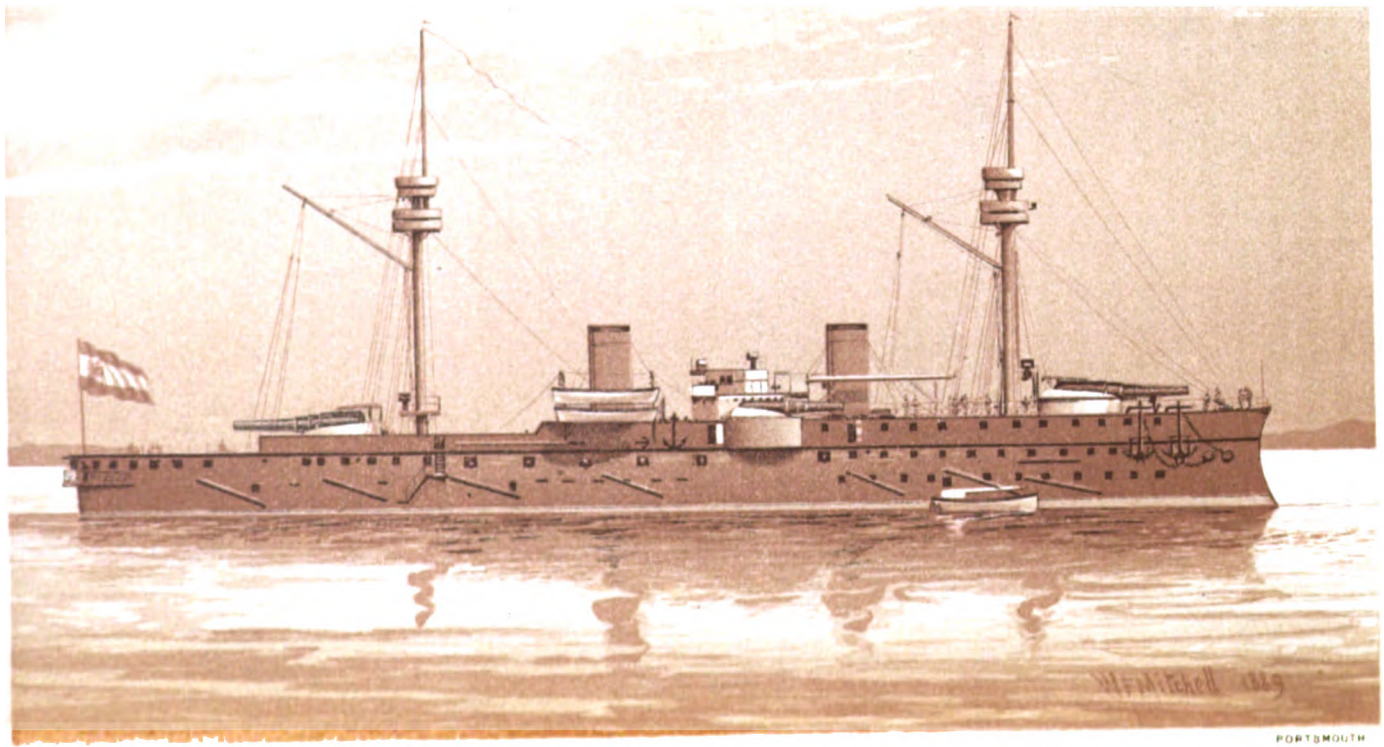

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matters, is to be assimilated to that of the army. It does not seem probable that a separate Naval Cabinet will be created. It is more likely that some naval members will join the existing Military Cabinet. But, as with the reconstruction, so with the reorganization. It is chiefly necessary in view of the completion of the ship canal. The Baltic and North Sea stations, each under an admiral who will rank as a general of division, will then be both under the ultimate control of a commander-in-chief, who will, doubtless, some day be Prince Henry. Hitherto they have been separate commands. The existence of the canal, especially if it be extended to Wilhelmshaven, will enable a single head to direct both stations and to ensure co-operation between them."

SPAIN.

Pelayo. The Pelayo is the most important addition in 1888 to the Spanish navy. A full description of her was published in *The Naval Annual* for 1887, and dimensions and other particulars of her construction will be found in the alphabetical list of ships in this volume. The Pelayo was built at La Seyne.

Speed on trial. The result of a series of trials gave a speed of 16·215 knots with natural draught, and 16·7 knots with forced draught. The coal supply is 800 tons, equal to 4500 miles at twelve knots, or 7500 miles at 10 knots.

RUSSIA.

We now turn to Russia. At the Admiralty Admiral Petchkuroff has been succeeded as Minister of Marine by Admiral N. M. Chikachoff, with Vice-Admiral Cremer as chief of Naval Staff, and Vice-Admiral Pilkin as president of the Naval Technical Committee. Under the direction of these officers shipbuilding operations on the extensive scale which has been witnessed in recent years are being actively pushed forward.

In the Baltic the most powerful ships lately built are the Admiral Nakhimoff, launched in 1885, and two powerful ironclads, the Emperor Nicholas I. and the Alexander II., in the completing stage.

Admiral Nakhimoff. The Admiral Nakhimoff was built at the Baltic Works on the Neva. She is of steel and iron, wood-sheathed. The following are the principal dimensions and particulars:—Displacement, 7782 tons; Dimensions. length, 330 feet; beam, 61 ft.; belt, 10-in. armour; turrets, 12 and 8-inch armour; backing, 8 inches; steel deck, 1½ inch in thickness; draught, 25·9 feet; 2 propellers; 8000 I.HP. The armament consists Armament. of eight 8-inch (9-ton) B.L. guns; ten 6-inch (4-ton) ditto; six machine

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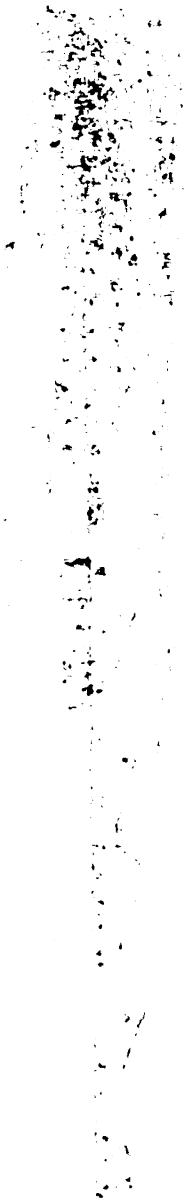

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guns; four fixed tubes or launching carriages for Whitehead torpedoes.

Cost. The Admiral Nakhimoff cost, without armour or guns, £280,000,

Speed. the total cost being £572,000. She has a speed of 16 knots, and a coal capacity of 1200 tons. With forced draught a speed of 17½ knots was attained at the official trial, the engines developing 9000 HP. At two progressive trials by the builders at specified draught, with a displacement of 7781·7 tons, and a propeller 16 inches in diameter, the speed was 16·33 knots with 98½ revolutions and 7768 HP., steam-pressure 66½ lb. without forced draught. The propeller was then altered to 17 inches diameter, and with 90½ revolutions she attained the same speed (16·33) with the same HP.

Trial. Before leaving Cronstadt, without any one on board belonging to the Baltic Works, with ordinary crew, bad coal, being 13 in. beyond her proper draught, and with a consequent displacement of 8259·7 tons, the Admiral Nakhimoff made 16·09 points, with 7508 HP. She may fairly be called, therefore, a 16-knot ship.

First sea trip. After her first sea trip to Copenhagen and back, there were rumours of very serious defects. It was reported even, in the English press, that the ship would have to undergo extensive alterations before she would be fit for sea. As a matter of fact, she encountered very heavy seas, and having no forecastle or bulwarks forward, shipped some heavy seas. The builders, on her return, wanted to take away the fore barbette and run up a forecastle. Captain Delivron, however, expressed himself satisfied with the ship as she was, and she sailed for the Pacific on October 4th, 1888, without any alterations. On this occasion she again experienced heavy weather as far as Kiel, but behaved well. Going 4 knots, with 35 revolutions, she pitched 6° equally bow and stern from 9 to 11 times a minute, shipping little or no water, and, the weather moderating, she made 11 knots with 59 revolutions.

Barbettes. The Admiral Nakhimoff has four armoured barbettes, one at each end and one on each side, like our Impérieuse and Warspite. The barbettes are protected by 8-inch compound armour to seaward and 7-in. in board. The backing consists of 8-inch vertical beams with a ¾ in. steel skin. Each barbette contains two long-range 8-inch B.R. guns on revolving platforms. She has also ten long-range 6-inch 4-ton guns forming her broadside battery. These guns were originally mounted on Pestich carriages, but after the breakdown of that system last summer they were changed for others of improved Vavasseur pattern designed by Captain Doubroff. These carriages were satisfactorily tried in August, 1888.

Steel protective deck. The Admiral Nakhimoff has a steel deck 1½ inch in thickness.

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Her belt extends from 5 feet below to 2 ft. 10 in. above the water-line; for 4 feet it is 10 in. and tapers to 6 in.

From the latest armoured cruiser of the Russian fleet we turn to the battle-ships. The principal features of the Nicolai I. and the Alexander II. are summarised in the following table:— Nicolai I. Alexander II.

NICOLAI I.—ALEXANDER II.

Material	Steel, wood-sheathed
Displacement	8440
Length	350
Beam	.67
Armour	14-in. on belt 10 „ „ barbette 8 „ „ conning tower
Backing	12-in. oak
Draught	23
Propeller	2
I.HP.	8000
Guns	2 12-in. 36 ton B.L.R. 4 9-in. B.L. 8 6-in. 4 ton B.L. 2 4-in. 10 Hotchkiss, 47 mm. 4 „ 37 mm.
Speed	15·8
Coal	700
Complement	570·0

Similar in all respects, these ships are built of iron and steel, sheathed with wood and coppered. They have strong ram bows and are brig-rigged. The armour protection consists of a complete steel belt, 9 feet wide and from 14 to 8 inches thick, and a complete curved steel protective deck 3 inches thick. The pear-shaped barbette tower forward is protected by 10-inch armour.

The Alexander II. was launched on the 26th July, 1887, at the new Admiralty works, St. Petersburg. She will be completed for sea during the summer of 1889.

The Nicolai I. was laid down at the Franco-Russe Company's works, at St. Petersburg, in 1889. She was to have been launched October 27th, 1886, but the launch was postponed till the spring of 1889, owing to the early closing of the Neva.

The following comparison is taken from the *Times*:—

	Warspite and Impérieuse.	Alexander II. and Nicolai I.
Displacement	8400	8440
I.HP.	10,000	8500
Speed	15·7	15·8
Thickest armour	12 in.	14 in.
Heavy guns	10	14
Weight of heavy armament	126 tons	199·76 tons
Weight of broadside	1060 lb.	1614 lbs.
Heavy guns pierce	19 in. armour	24 in. armour
Crew	514	570

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The Russian ships have a complete, the English a partial, belt. Each Russian ship has six armour-piercing guns. The English ships carry four armour-piercing guns.

Black Sea fleet.

In the Black Sea great efforts have been made by Russia to create a powerful fleet. The three vessels most advanced towards completion are the Tchesmé, the Sinope, and the Catherine II. The last-named vessel was built and launched at Nicolaieff on the 21st May, 1886. Of the two others built at Sebastopol one was launched in 1886 and the other in 1887.

The following paragraph is taken from the memorandum by Lieut. Colwell, U.S.N., in the General Information series, Washington:—

Tchesmé, Sinope, Catherine II.

"These additions to the Russian fleet are the most powerful battle-ships that Government possesses. The first two were laid down in November, 1883, and were launched in May, 1886; the last was laid down in April, 1884, and was launched June 1, 1887. They are built of iron and steel, have heavy ram bows, will carry complements of 500 men, and a coal supply of 870 tons. Principal dimensions: Length, 339 feet; beam, 69 feet; mean draught, 26 feet 6 inches; displacement, 10,181 tons. Armament, six 12-inch B. L. mounted in pairs *en barbette*, in a large central pear-shaped redoubt on Moncrieff disappearing carriages, six 6-inch B. L. on gun-deck in broadside, one 6-inch B. L. shifting pivot aft on gun-deck, seven H. R. C., and a supply of Whitehead torpedoes, which may be discharged through seven tubes. The armour protection consists of a complete belt of compound armour 16 to 12 inches thick, and a complete steel protective deck 3 inches thick. The armour on the redoubt is 14 inches thick. The engines of the Catherine II. were built at the Baltic Works at St. Petersburg, and are of the compound vertical 3-cylinder type, designed to develop 11,000 I.HP. and a speed of 16 knots. The engines of the Tchesmé are of the same type, and were built in Belgium by Cockerill, while the Sinope's engines were built by Napier, at Glasgow, and are triple expansion, designed to develop 10,000 I.HP. with natural draught and 13,000 I.HP. with forced draft. The boilers of all are cylindrical, fourteen in number, with three furnaces in each. The cost of each vessel complete for sea will be about £900,000."

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The disposition of the turrets can be best understood by a reference to the plan in *Pls.* ***116*** and ***117***.

The Tchesmé is the only one of the three ships which has had full power official trials, in which she developed, with natural draught, 9058 HP. (or 58 HP. more than the contract) and made 13½ knots. Not being wood-sheathed, the bottom was very foul. The normal

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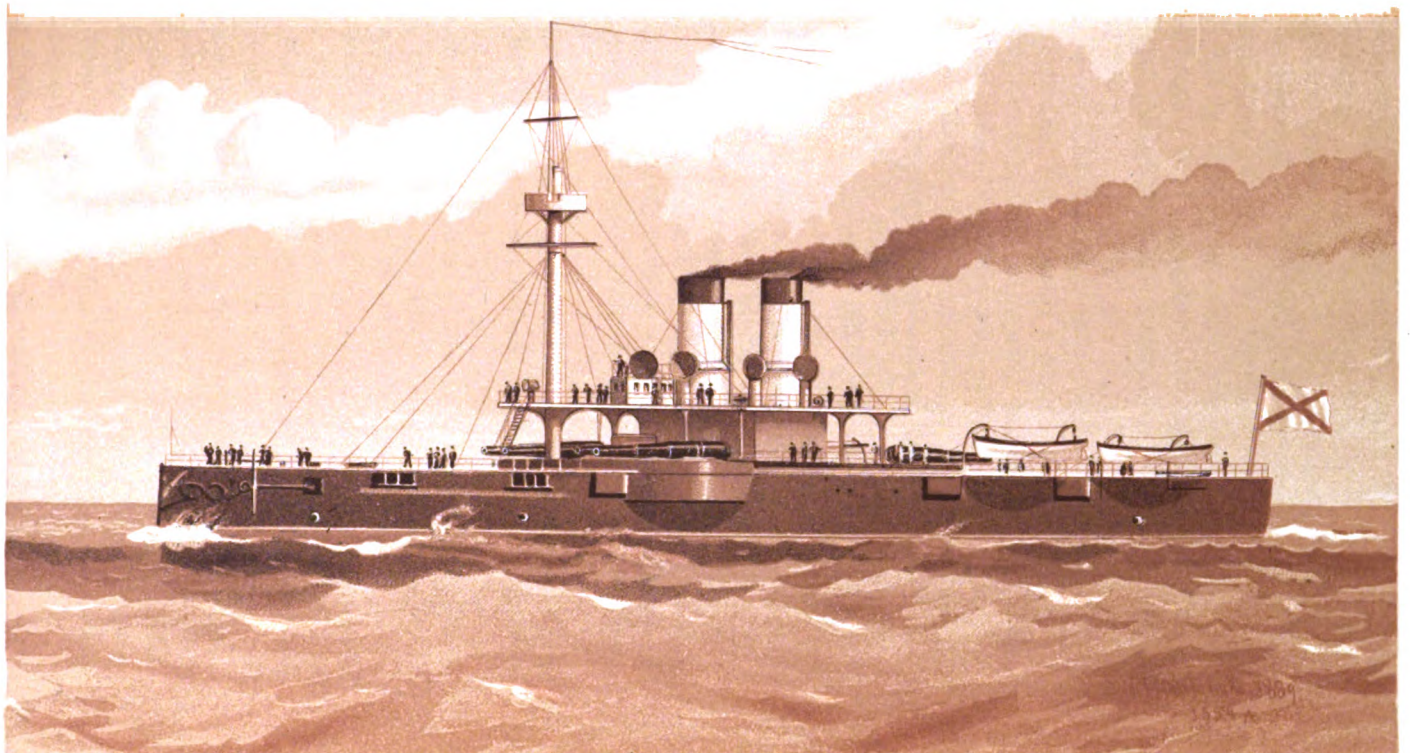

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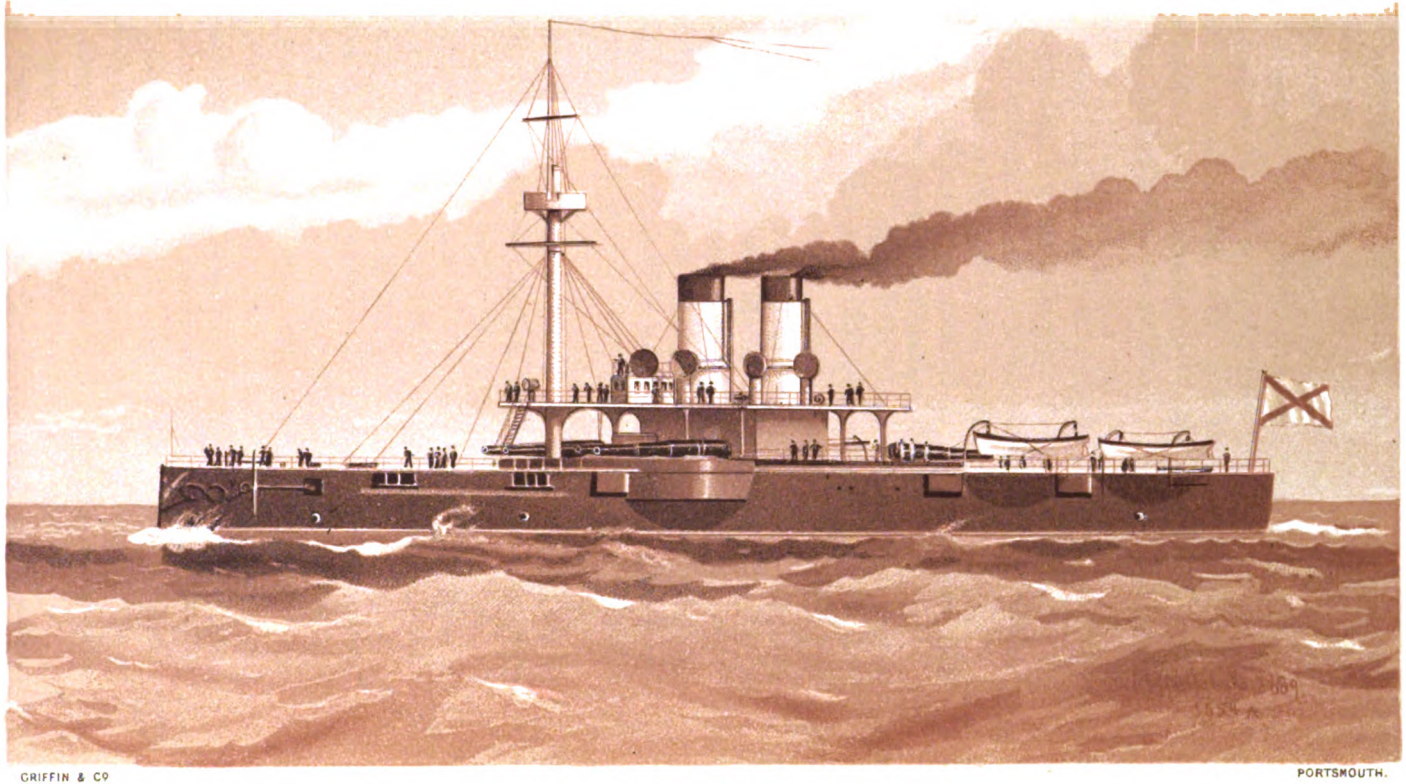

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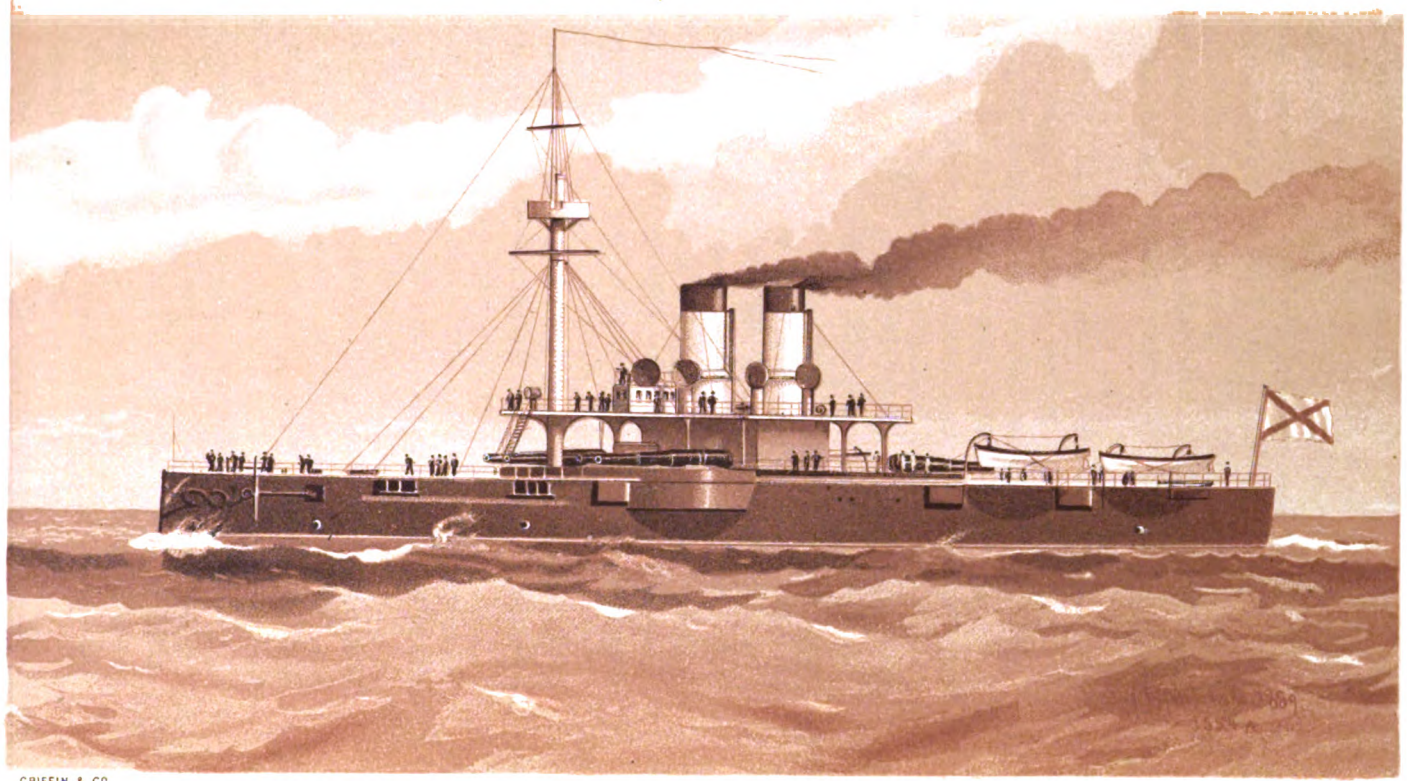

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speed will probably be from 14½ to 15 knots. Her 12-inch guns were made by Krupp. Though nominally long range, they are only to be fired with short-range charges, as they are somewhat defective. These guns are mounted on hydraulic carriages made at the Motala Works in Russia from designs by M. Alexeoff.

Sinope.

The Sinope had an official trial on the 27th October, and is said to have made 16 knots. It is reported that her power was much under contract and that further trials are necessary. She was engined by Messrs. Napier.

Catherine II.

In the case of the Catherine II. it is important to note that, owing to a blunder in design, her barbette armour has no backing, the barbette slightly overhangs the ship's sides, whereas in the Sinope it is flush. She has had no full-power trials as yet. The 12-inch short-range guns of the Catherine II. are mounted on Anderson's hydraulic disappearing carriages, made at the Oboukhoff Works.

New ironclads.

Two more ironclad ships must be briefly described. One named the Twelve Apostles, building at Nicolaieff, of about 8200 tons, with an armoured belt 14 in. thick, and with unprotected ends. It is a peculiar feature of the design that the upper works are fitted with three decks. The casemate has 12-inch armour; the upper tower 5-inch armour. The two sets of triple-expansion engines, to develop 8500 HP., are to be made at the Baltic Works, St. Petersburg.

Another ship, not named, of 6590 tons, with casemate, armoured belt, and unprotected ends, has just been commenced at the Franco-Russian Works.

The ironclad commenced at Nicolaieff at the private yard of M. Volodine has been finally abandoned and the contract cancelled after some 36 tons of steel had been put in her keel.

It is believed that a facsimile of the Sinope will be ordered at Sebastopol, a new ironclad at the Franco-Russe Company's Works, and possibly a third ship at the Baltic Works.

Russia has made a commencement in the construction of armoured cruisers. The Pamyat Azova was commenced in March 1886, and launched on the 1st June, 1888, in the presence of the Czar and Czarena. She is represented in *Pl.* 124, and her dimensions and other particulars are given in the alphabetical list of Russian ships.

Propelling machinery.

The Pamyat Azova is fitted with two sets of triple-expansion engines. Diameter of cylinders, 41 in., 60 in., and 90 in.; stroke of piston, 3 ft. 3 in. With ordinary draught she is expected to make 17 knots; with forced draught developing 11,500 HP. and 115 revolutions 18 knots. Diameter of screws, 16 ft. 6 in.; pitch 19 feet.

Boilers.

She has six double boilers, with six corrugated flues; diameter of

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boilers, 15 ft. 3 in.; length, 16 ft. 3 in. Heating surface of all boilers, 19,946 square feet; working pressure in boilers, 130 pounds to square inch. Weight of engines and boilers with water, 1150 tons. Sail surface, 16,000 square feet.

Armour. Her belt is 260 feet long, has a maximum thickness of 9 inches, and it extends from 2½ feet above to 5 feet below W. L.

Gun vessels, Terets type. The Russians have recently reinforced their fleet of small cruisers in the Black Sea with six vessels of the Terets type. Of these six vessels the Uraletz, Teretz, and Kubanetz were laid down by the Russian Government at Sebastopol in 1886 and engined by the Motala Works Co. (Sweden), the Zaporitz, Donetz, and Choonomoretz were laid down by Government at Nicolaieff also in 1886 and engined by Napier.

Dimensions. Their leading features are: Length, 210 feet; breadth, 35 feet; draught of water, 10; HP., 2000; armament, two 8-in., one 4-in. B. L. R.; six machine-guns; two torpedo tubes.

Steam trials. The Zaporitz at a trial on July 20th, at Nicolaieff, made 11 knots. Several shots were fired from her 8-in. and 6-in. guns with satisfactory results. Later she made a trial trip to Sebastopol and back, realizing a speed of from 12 to 13 knots. The pitch of the screw has since been increased, and it is requisite to raise the vacuum and the condenser from 19 to 27 in. Ventilation was very bad, but she is expected to make 15 knots eventually without forced draught. The Teretz was completed by July 20th, when she started for Batoum to replace the Kubanetz as guardship. The Uraletz on the same date made her final trial and was accepted from the builders.

At the beginning of September the Kubanetz and Uraletz conveyed the late Minister of Marine, Admiral Peshtchuroff, from Sebastopol to Novowisk and back; they had severe weather on the return journey, and proved good sea-boats.

Russia has two other vessels of the same type. The Coreetz, launched in 1886, is attached to the Siberian squadron. The Mandjur is building for the Baltic fleet.

A larger gunboat, not named, 1500 tons, with a belt of 5-inch compressed armour, a protecting deck 1½ inches thick, one 16-in. long range B. L. R., two 8-in guns, speed 15 knots, is building at the New Admiralty Works, St. Petersburg.

New Royal yacht. The new Imperial yacht, Polyarnaza Zviezda, or Pole Star, was laid down in the spring of 1888 at the Baltic Works. Her dimensions are: Length, 314 ft. 10 in. W. L.; beam 46 ft.; draught, 18·8; displacement, 3346½ tons. She is being built of steel, and is to have engines of 6000 HP. with a speed of 16 knots.

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The former Imperial yacht Livadia, built by John Elder & Co., having been dismantled and christened the Opnit or Experiment, is now said to have been fitted as a transport for 4000 men. She lies at Sebastopol, and her costly furniture has been presented to the new Naval Club House there. Livadia.

UNITED STATES.

The following descriptions of new ships have been taken from the *United States General Information* series :—

"The battle-ship Texas is to be built at the Norfolk Navy Yard on designs by Mr. W. John, general manager of the late Barrow Shipbuilding Company. Texas.

"The main battery consists of two 12-in. B. L. and six 6-in. B. L. guns. The former are in turrets placed *en échelon*, the port one forward and the starboard one aft. The train of port gun is 180° on port side, and from abeam to 40° forward on starboard side; the after one trains 180° on starboard and 70° on port side. Two of the 6-in. guns are on the upper deck, one forward, one aft, near the 12-in. guns, and each trains through 240°; the others are in sponsons on the lower deck, two on each side, with firing arcs of 150°. The secondary battery is composed of four 6-pounder and four 3-pounder R. F. G.*, four 47-millimetre and four 37-millimetre R. C.†, and two Gatlings. Four torpedo-launching tubes will be fitted. Armament.

"The estimated speed is 17 knots, and the I.HP. with forced draught 8600. The engines, driving twin screws are triple-expansion; diameters of cylinders, 36, 51, and 78 inches; length of stroke, 39 inches. Steam is taken from four double-ended boilers, 27 feet long and having a diameter of 14 feet. Speed. Engines.

"The normal coal allowance is 500 tons; 950 tons can be carried, giving a radius of efficiency of 3137 nautical miles at a speed of 15·2 knots,‡ 4500 at 13·3 knots,§ and 8592 at 10 knots. Coal supply.

"For defence the vessel has a water-line belt of 12-inch steel armour in wake of magazines, engines, and boilers. The ends of the belt armour are connected by V-shaped, 6-inch steel bulkheads. An armoured redoubt runs diagonally across on main deck, enclosing and protecting bases of turrets and their machinery; this, as well as the turret armour, is 12-inch steel. The conning tower has the same protection. The ammunition tubes have 6-inch, and the tube from conning tower down to the protective deck 3-inch steel protection. The protective deck, 3 inches thick, covers the armour belt and Armour.

* Rapid fire guns. † Revolving cannon.
‡ Maximum natural draught speed. § Two-third natural draught, or sea speed.

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"The estimated speed is 17 knots, and the I.HP. with forced draught 8600. The engines, driving twin screws are triple-expansion; diameters of cylinders, 36, 51, and 78 inches; length of stroke, 39 inches. Steam is taken from four double-ended boilers, 27 feet long and having a diameter of 14 feet. Speed. Engines.

"The normal coal allowance is 500 tons; 950 tons can be carried, giving a radius of efficiency of 3137 nautical miles at a speed of 15·2 knots,‡ 4500 at 13·3 knots,§ and 8592 at 10 knots. Coal supply.

"For defence the vessel has a water-line belt of 12-inch steel armour in wake of magazines, engines, and boilers. The ends of the belt armour are connected by V-shaped, 6-inch steel bulkheads. An armoured redoubt runs diagonally across on main deck, enclosing and protecting bases of turrets and their machinery; this, as well as the turret armour, is 12-inch steel. The conning tower has the same protection. The ammunition tubes have 6-inch, and the tube from conning tower down to the protective deck 3-inch steel protection. The protective deck, 3 inches thick, covers the armour belt and Armour.

* Rapid fire guns.
† Revolving cannon.
‡ Maximum natural draught speed.
§ Two-third natural draught, or sea speed.

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curves down forward and abaft it to stem and stern. Coal bunkers are outboard of and above boiler and engine-rooms.

"Between the starboard and port fire-rooms are magazines and shell-rooms with a fore-and-aft passage above them communicating with additional ammunition spaces forward of fire-room, and abaft engines.

Displacement. "The displacement, at normal draught of 22 feet forward and 23 feet aft, is 6300 tons; with 950 tons of coal on board it is 6750.

"The length between perpendiculars is 290 feet, and extreme beam 61 feet 1 inch.

"The Texas is to be built of steel. She will have a double bottom and numerous watertight compartments; there are to be two masts with military tops; electric search lights are to be placed on hurricane deck and chart-house. The estimated cost exclusive of armament is £475,000.

Maine. "The designs for the armoured cruiser Maine were prepared in the Navy Department. She is an improved and enlarged Riachuelo, a Brazilian armoured cruiser built by Samuda at Poplar and launched in June 1883.

Armament. "The armament comprises four 10-in. B. L. and six 6-in. B. L. guns. The heavy guns are mounted in pairs in the two turrets placed *en échelon* on main deck, the forward turret on starboard side, the after on port; the forward pair of guns thus has an arc of train of 180° on starboard side and 57° to port, the after pair 57° to starboard and 180° on port side. The 6-in. guns are provided with 2-in. shields; two are in recessed bow ports with a train of 93° forward and 50° abaft beam, two are similarly placed in quarter ports, two are on superstructure deck in broadside, each with a fire of 65° forward and abaft the beam.

"The secondary battery numbers four 6-pounders and four 3-pounder R. F. G., four 47-millimetre and nine 37-millimetre R. C., and four Gatlings. There are to be seven torpedo tubes.

Speed. Horse-power. Engines. Boilers. "The estimated speed is 17 knots, and the I.HP. 8750 with forced draught. The twin screws are worked by two vertical triple-expansion engines in separate water-tight compartments; the diameters of cylinders are 35·5, 57, and 88 inches; length of stroke, 36 inches. Steam is taken from eight cylindrical return-tubular boilers 14 feet and 8 inches in diameter and 10 feet long.

Coal supply. "The normal coal allowance is 400 tons. The total capacity is 822: with this the effective radius is 2770 miles at 14·8 knots,* 3960 at 13 knots,† and 7000 at 10 knots.

Armour. "The protection consists of a steel armour belt 180 feet long, having

* Revolving cannon. † Maximum natural draught speed.

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a thickness of 11 inches down to 1 foot below water-line, and from there tapering to 6 inches at bottom; the two forward ends are joined by an athwartship bulkhead of 6-inch steel armour. Above it, but below turrets and protecting their bases, loading tubes, machinery, etc., are oval redoubts carrying 10-inch armour; the turret armour varies from 10·5 inches to 11·5 inches in thickness. The conning tower is 10 inches thick, and a 4·5 inch tube runs down from it to protective deck. This deck is 2 inches thick over belt and 4 inches where it slopes down aft between its ends; forward and abaft belt the deck is 2 inches thick.

Protective deck.

"Coffer-dams 3 feet high are built around engine and fire-room hatches. The vessel has a double bottom and numerous water-tight compartments.

"The Maine is bark-rigged and spreads 7135 square feet of canvas. Military tops are carried on fore and main masts. The principal dimensions are: Length between perpendiculars, 310 feet; beam, 57 feet; displacement, 6648 tons at a mean draught of 21 feet 6 inches.

Rig dimensions.

"The estimated cost of hull and machinery is £490,000."

III.—PROTECTED AND UNARMOURED SHIPS.

Great Britain.

In the protected and unarmoured classes the most important ships which have been put in hand for the British Navy are the Blake and the Blenheim. The former is building at Chatham, the latter at the Thames Iron Works, Blackwall. As described in the memorandum issued by Lord George Hamilton with the Navy Estimates of 1888–9, these ships will surpass in speed, coal capacity, protection, and armament, any of the same class yet designed.

Blake.

Blenheim.

Length	375 ft.
Breadth	65 ,,
Displacement (about)	9000 tons
Speed on measured mile with full coal supply	22 knots
Speed at sea, continuous steaming	20 ,,

Radius of action:

At 10 knots, about	15,000 ,,
At 20 ,, ,,	3000 ,,

The armament is provisionally as follows:

Two 9·2-in. 22-ton bow and stern chasers.
Ten 6-in. 5-ton quick-firers, broadside.
Eighteen 3-pounders, quick-firers.
Four torpedo tubes.

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Protective deck. A protective steel deck will run throughout the length of the ship. It will have a maximum thickness of 6 inches, which, it is said, will afford the same protection from the "direct blows of projectiles" as would a vertical plate of 12 inches thickness.

Engines. These vessels will be fitted with triple-expansion engines, of 20,000 indicated horse power, for a speed of 22 knots. They will carry coals sufficient for a voyage of 15,000 knots.

It was decided that the Blake and Blenheim, although of 50 per cent. greater dimensions than the vessels of the Orlando class, should have no side armour. The decision has been criticised in many quarters. Without attempting to pronounce judgment on the method of protection, it may be remarked that high praise is due to the designers for the splendid form of the hull. The mission of the Blake class is to guard our trade on the ocean. Such ships will be of especial value for the defence of the trade with Australasia.

Blake's mission.

Vulcan. The Vulcan, the torpedo depôt ship which is to replace the Hecla, is another very interesting vessel. Her principal dimensions will be:—

Length	350 ft.
Breadth	58 „
Displacement (about)	6600 tons
Speed with full coal supply on measured mile	20 knots
Speed with full coal supply at sea (continuous steaming)	18 „

Radius of action:

At 10 knots (about)	12,000 „
„ 18 „ „	3000 „

Armament:

Eight 36-pounders, quick-firers.
Twelve 3-pounders „
Four to six torpedo tubes.

Engines. As described in the *Times*, the Vulcan will be engined by Humphrys with triple-expansion machinery guaranteed to develop at least 12,000 horses, which will give her a speed of 20 knots on the measured mile and 18 knots under continuous steaming at sea.

Coal supply. With a thousand tons of coal in her bunkers, she will be able to travel 12,000 knots at 10 knots and 3000 knots at 18 knots speed.

Lifting gear for torpedo boats. According to Lord George Hamilton, the Vulcan is to be described as a swift protected cruiser, fitted with special appliances for lifting and carrying a considerable number of the largest type of second-class torpedo boats. Such appliances are absolutely necessary, seeing the manner in which these delicate little craft and their crews are knocked

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about in stormy weather in the process of lifting and lowering them. The ship will also be equipped with a laboratory, workshop, a powerful torpedo armament, and an ample supply of torpedoes, stores, submarine mines, and electrical appliances. As she will have an armament of eight 36-pounder and twelve 3-pounder quick-firing guns, she will also be capable of protecting herself against all except the largest classes of cruisers, which her great speed will enable her when necessary to avoid, while she will act as a base of operations for a torpedo boat flotilla or the torpedo boats of a fleet.

Electrical appliances, &c.

Armament.

In addition to fulfilling all these functions, she will have the means of repairing torpedoes, torpedo craft, and their machinery, be a practice ship for all kinds of torpedo and mining work, and will carry all the gear required for submarine mining operations on a large scale. The vitals of the ship will be protected in the orthodox way by a protective steel deck, which will, in this instance, have a *maximum* thickness of 5 inches and a *minimum* thickness of 2½ inches.

Torpedo factory.

Protective deck.

At this point it may be convenient to give a summary of the various classes of cruisers in course of construction during 1888. We reprint for this purpose a list taken from the columns of *Engineering*. In an accompanying editorial note it is appropriately observed that within a recent period there has been effected a virtual reconstruction of the cruiser class. This will be evident on running down the list of vessels with speed so largely in excess of those accepted as sufficient for the requirements of the service within a recent period.

	Tons.	Maximum speed. Knots.
Protected, Blake class	9000	22
„ Vulcan class (torpedo depot ship)	6600	20
Armour-belted, Orlando class	5600	18·5
Protected, Mersey class	4000	18
„ Medea class	2800 to 3000	20 to 19¾
„ For Australasian service	2500	19
„ Bellona class	1800	19½
„ Blanche class	1600	16½
Unprotected, Archer class	1770	17
„ Rattlesnake class	550	18½ to 19
„ Sharpshooter class	730	21

The designs for the Blake, Vulcan, Medea, Bellona, Blanche, Sharpshooter, and Australian cruisers were prepared under the directions of Mr. White. Those for the Orlando, Mersey, Archer, and Rattlesnake were prepared under the supervision of Sir Nathaniel Barnaby.

Having given the details of construction of the Blake, Blenheim, and Vulcan we give a description of a smaller class from

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Engineering of May 18th, 1888. The vessels we are about to describe form a group of five protected cruisers. The type possesses many new features in design and construction, and is a further development of a type of war-ship, which, although not yet tried in actual warfare, is looked upon favourably by some naval constructors as a valuable auxiliary to the much more powerful and fully equipped ironclad. The five vessels are named Medea, Medusa, Melpomene, Magicienne, and Marathon. The first two are building at Chatham, the Melpomene at Portsmouth, and the two last-named in the shipbuilding yard of the Fairfield Shipbuilding and Engineering Company at Govan, Glasgow. The vessels are similar in dimensions and in their internal arrangements; but the constructive material and engines are different. The Medea and Medusa are being built entirely of steel, and their displacement tonnage will be 2800 tons. Their engines are placed vertically, with inverted cylinders. In the case of the other three ships, the steel hulls are sheathed with wood and copper to enable them to remain afloat for long periods without having their bottoms "fouled" and their speed consequently reduced. This sheathing, increases the displacement to 2950 tons, and their speed may consequently be reduced by about ¼ knot to about 19¾ knots. Even in view of this slight loss of speed and the additional first cost which such an arrangement involves, the change of plan is acceptable, as it will give the cruisers an additional advantage over ordinary vessels, rendering them able to lie in coaling or other stations for a long period, and to be afterwards available for a speedy voyage to action, without the necessity of entering a dock, in which to have the bottom cleaned. With the exceptions indicated, the five cruisers are alike. They are 265 feet long, 41 feet beam, and about 24 feet deep. The three vessels referred to are first built of steel in the usual manner and afterwards sheathed with two thicknesses of teak, making together a thickness of 6 inches. The inside layer is attached to the steel hull by iron bolts, and the outside one by bolts of gun-metal. The bottom is further covered with sheets of copper nailed to the teak. The ram, stem, stern, and rudder-posts, and the brackets for supporting the twin screws are all cast in solid bronze, these castings together weighing for each ship about 45 tons. The form is similar to those generally used in the construction of Government vessels, the stern casting being the more intricate. The whole structure is built and strengthened in such a way as to offer the maximum resistance to artillery.

Medea class.

Three are sheathed with copper.

Advantages of a coppered bottom.

Brass castings.

Protective deck.

"For protection the vessel depends principally on a 2-inch steel deck

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extending from stem to stern. This deck resembles the back of a turtle, having a declivity at bow and stern and along the sides of the vessel. The top level of the deck—in the centre of the ship—is about a foot above the water-line, and the declination all round makes the connection of the deck with the side of the ship at a point about 5 feet from the water-line. Under this deck are placed the propelling engines and the machinery for working the ship—all the vital parts of the mechanism—as well as the magazines. The coal bunkers are arranged above and below the deck in that part of the vessel where the engines, boilers, &c., are situated, so that additional protection may thus be secured. The vessel has a double bottom on the cellular principle for carrying water ballast. The interior of the hull is divided by bulkheads into ten main water-tight compartments, two of which are occupied by engines, and two others by boilers. These four have no doorways between the spaces, but in some of the other bulkheads there have been fitted doors workable either at the door or from the top deck. In addition, these main compartments are subdivided, especially above the protective deck, there being in all close on 270 water-tight spaces.

Double bottom.

"The armament of the ship consists of six 6-inch (5-ton) breech-loading rifle guns, on central pivot Vavasseur mountings, two placed forward, two aft, and one each on starboard and port side amidships; ten 6-pounder and one 3-pounder quick-firing guns, three light guns under 15 cwt., and several machine guns. Six torpedo tubes are to be fitted on board, all under cover, one forward, another aft, and two on each broadside.

Armament.

"Accommodation has been provided for a crew of about 300 men all told. The officers are accommodated under the poop aft, and the 'tars' forward. There are the usual cabins, ward, gun, and mess-rooms. The external appearance of the vessels will be smart. They have each two funnels and two masts. They will only have fore and aft steadying sails, the vessels being solely dependent upon their steam power and twin screws to drive them along at a high speed of 19¾ or 20 knots. The military tops are to be dispensed with in these vessels. This many will regard as a step in the right direction, as the 'crow's nest' has been looked upon often as the most likely spot at which the enemy would aim.

Complement.

"The estimated cost of the hull is £64,790; of the machinery at £50,824. The total cost of each of these vessels complete with guns, gun mountings, torpedo gear, and stores, is calculated to be about £173,000. They were designed under the supervision of Mr. W. H. White, Director of Naval Construction."

Estimated cost.

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The five ships of the Marathon type are all launched and advancing to completion.

The following description of the steam trials of the Medea is from the *Times*:—

Medea's steam trials.

"The new protected cruiser Medea, built at Chatham and engined by Messrs. Humphrys & Tennant, completed her contractors' machinery trials at Portsmouth. The other ships of the type are the Medusa, like the Medea, unsheathed, and the Melpomene, Marathon, and Magicienne (sheathed and coppered). They are designed to realize speeds of 20 and 19¾ knots respectively; and, for the purpose of showing at what an enormous expenditure of energy these high speeds are attained, it may be mentioned that the Medea, with a displacement of 2800 tons, is fitted with engines of substantially the same indicated horse-power as the 16½-knot armour-clad Collingwood, with a displacement of 9500 tons, or between three and four times the weight. The engines are of the twin-screw triple-expansion type, with cylinders of 33½ inches, 47 inches, and 74 inches respectively and a stroke of 3 ft. 3 inches, and are under the protection of the sloping armour deck. The engines were first tried for endurance under natural draught, the continuous full-power run extending over 12 hours. Under the new regulations, whereby the steam trials of a new ship are made to afford a practical test of her performances under actual conditions of service, the Medea was brought down by ballast to her designed load-line, the draught forward being 15 feet 3 inches, and that aft 17 feet 9 inches, giving a mean immersion of 16 feet 6 inches. The result of the long steaming gave a mean collective indicated horse-power of 6099 and a speed, as measured by log, of from 17 to 18 knots. The crucial run of four hours under forced draught was made on Thursday under favourable conditions of weather. This might also be regarded as a test of endurance, for, besides determining the maximum resources of the engines, it may be fairly assumed that, except in action or under circumstances of emergency, they are not likely to be pressed for so long a period at their full power. The mean results of the trial were:—Steam in boilers, 149 lb.; vacuum, 26 inches; revolutions, 140; and collective indicated power, 9183 horses. Though the power developed was in excess of the contract, and the trial was thus satisfactory from the point of view of the engineers, the speed obtained on the occasion was less than what the ship may be expected to realize when she is finally completed for commission. The trials were in a large measure experimental, and, from the few intermediate runs that were made on the measured mile under different rates of speed, it was abundantly obvious that

Engines.

Draught of water.

Horse-power.

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the present form of propeller, in consequence of the great amount of slip noticed, was not exactly suited to the ship. The result was that much of the power developed by the engines was wasted in churning the water. It has been decided to fit the Medea with new screws, after which she will be subjected to a series of progressive mile trials. At the conclusion of the trial the Medea returned to Chatham."

This class leave nothing to be desired in their symmetrical proportions. They are adequately armed, and are well fitted to keep the seas. Being, however, without protection by armour, they are of necessity extremely fragile. Protection by armour could not have been given without adding largely to tonnage and consequently diminishing the numbers which could be turned out for the sum appropriated by Parliament for the construction of cruisers.

Blanche class.

We now come to the third class of cruisers. They will be of two types. For distant service, where dock accommodation does not exist, the vessels of the Blanche class will be wood-sheathed and coppered.

Barham, Bellona.

For service within the limits of the Channel or the Mediterranean, two vessels, the Barham and Bellona, are to be laid down which will not be sheathed and coppered. They will resemble the Blanche in armament and protection, but will have higher speed.

The description of the Blanche class is from the *Times* and the *Army and Navy Gazette*:—

"The Barrosa has for sisters the Barracouta, Blanche, and Blonde. Her dimensions are: Length, 220 feet; breadth, 35 feet; and mean load draught, 14 feet. She has a displacement of 1580 tons, and, although this is only 410 tons more than the Beagle it is sufficient to remove the latter from the category of third-class cruisers. The protective steel deck, which has a sharp slope at the sides, has a *maximum* thickness of two inches over vitals and a *minimum* thickness of an inch in parts. She differs from the Beagle in having a number of water-tight compartments, formed by longitudinal and athwartship bulkheads in the forward and after portions of the ship beneath the protective deck. Another novelty is that in place of the usual flat keel she is furnished with a ridge keel, which is also made water-tight. Her engines are designed to develop 3000 horses under forced draught, by which an accelerated speed of 16½ knots will be secured. But, while the power of her engines is a considerable advance upon that of the Beagle, her bunker capacity is precisely the same (160 tons). The amount of coal carried is estimated to enable her to steam 3500 knots at a speed of 10 knots.

Protective deck.

Engines.

Radius of action.

"The armament of the Barrosa consists of six 4·7 inch 36-pounder Armstrong quick-firing guns, fitted with stout armour shields—two on

Armament.

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elevated steel central pivots, occupying either flank of the forecastle, two similarly situated abaft upon the poop deck, and two mounted upon central steel pivots as sponson guns abeam—four Hotchkiss 3-pounder quick-firing, and two Gardner guns. There are also torpedo tubes fitted. Bow and stern are both sharp in outline, the former being slightly ram-shaped, but without the *bec*, as it is called in France. On either side of both bow and stern are curious butterfly-shaped pieces cut out of the plates of the vessel. These are fitted with angular, bent port-plates, so continued as only to expose the muzzles of the four Hotchkiss guns, which are mounted upon swivels within, but which have, nevertheless, a wide radius of fire. Hence, in approaching or retiring from an enemy, by a slight deviation to starboard or to port the Barrosa could bring the whole of her 36-pounders and two of her Hotchkiss guns to bear upon the foe simultaneously. When one reflects that each of these weapons can be discharged—*with aim*—ten times in the course of a single minute, it follows that the object, if at a reasonable range, would probably receive some 30 or 40 hits during that period. Under such circumstances, the number of possible casualties upon an unarmoured cruiser is too frightful to contemplate."

Barham. Bellona.

The Barham and Bellona have 220 tons more displacement than the Barrosa, and finer lines. They have the same armament as the Barrosa. Their estimated speed is 19·5 knots.

In the refits and rearmaments of the unarmoured vessels there is naturally less to notice than in the case of armoured vessels.

Iris. Mercury. Cleopatra.

The Iris and the Mercury have been rearmed with thirteen 5-inch 40 cwt. breech-loading guns. The Cleopatra has received an armament consisting of four 6-inch 89 cwt. breech-loading guns, on Vavasseur's central pivot mountings, two being placed on elevated platforms forward and two on elevated platforms aft, eight 5-inch 40 cwt. breech-loading guns on Vavasseur carriages on the broadside amidships, one 9-pounder 6-cwt. and one 7-pounder 200 lb. weight field guns, four 3-pounder Hotchkiss quick-firing guns, four 0·45 five-barrel Nordenfelt, and four 0·45 barrel Gardner guns. The charges for the 6-inch guns are 45 pounds of powder, with projectiles weighing 100 pounds. The 5-inch guns have a charge of 16 pounds of powder, and projectiles of 50 pounds. The 5-inch guns were fired with full charges of powder and projectile at extreme elevation and depression.

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France.

The most important additions to the fleets of cruisers in foreign navies will now be described. Quoting from the *Admiralty and Horse Guards Gazette*, we begin with the recent construction in France.

Cruisers.

"A French contemporary publishes an interesting summary regarding the construction of cruisers built and building for the French Navy from 1886 up to the present time, either in the Navy yards or ordered of private shipbuilders. They number twelve, although originally more were planned, and they comprise two classes. The cruisers of the first class comprise three types, the first of which is represented by the Alger, from the designs of M. Marchal, the second by the Jean-Bart and Isly, from the plans of M. Thibaudier. The Alger is of the following dimensions: Length, 346 feet; extreme breadth, 45 feet 3 inches; draught of water amidships, 18 feet 1 inch; displacement, 4160 tons. This vessel is building at Cherbourg. Her engines, of 8000 indicated horse-power, are being constructed at Creusot. They are expected to propel her at a speed of 19 knots. The Jean-Bart and Isly have the following dimensions: Length, 346 feet; extreme breadth, 43 feet 6 inches; draught amidships, 18 feet 10 inches; displacement, 4160 tons. Their engines, of 8000 horse-power, building at Indret, are to give the cruisers a speed of 19 knots. All these cruisers are, of course, protected by an armoured deck.

1st class cruisers.
Alger.
Jean-Bart.
Isly.

Of the cruisers of the second class two different types were proposed. One type, including the Davoust and Suchet, was designed by M. de Bussy; the other, the Chanzy, was to be constructed to the designs of the Société de la Loire. The construction of the latter was countermanded owing to the want of money, as a portion of the extra 26,000,000 francs voted for the cruiser fleet was absorbed by the deficit in the Marine Budget. The third-class cruisers, Lalande, Cosmao, and Coetlogon, could not be withdrawn from the building programme, because the contracts had been ratified by Admiral Aube just before his retirement. The more useful vessels, Chanzy and Mogador, had to be sacrificed, while the less valuable ones were commenced. The Davoust and Suchet were built at Toulon Arsenal, their engines at Indret. The principal dimensions of those cruisers are: Length between perpendiculars, 297½ feet; extreme breadth, 40 feet; draught of water amidships, 17 ft. 6 in.; displacement, 3027 tons; engines, 9000 indicated horse-power; expected speed, 20 knots. With their supply of coal they will be able to steam 4000 miles at a speed of 12½ knots an hour. Their armament consists of four 16-centimetre guns, four quick-firing guns, and six 37-millimetre revolver guns.

2nd class cruisers.
Davoust.
Suchet.
Chanzy.
Mogador.
Davoust.
Suchet.
Armament.

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Forbin. Surcouf. Coetlogon. Troude. Lalande. Cosmao.

The cruisers of the third class, of which the Forbin is a representative type, consist of the Forbin, Surcouf, and Coetlogon, built from designs by M. de Bussy, Inspector-General of Shipbuilding, and the Troude, Lalande, and Cosmao, built from designs by the Société de la Gironde. The Forbin was built at Rochefort Arsenal, the Surcouf at Cherbourg, the Coetlogon by the Société Transatlantique, and the three remaining by the Société de la Gironde at Bordeaux. The principal dimensions of the first three vessels are: Length between perpendiculars, 312 feet; extreme breadth, 30½ feet; draught of water amidships, 16 feet; total displacement, 1850 tons. An armoured deck, 1½ inch thick, extends over the whole of the vessels, whilst below is a splinter deck, which protects all the vital parts. The propelling machinery consists of two horizontal direct-acting compound engines, supplied with steam from six cylindrical boilers, placed in three separate compartments. The engines are to develop with forced draught 6000 indicated horse-power, and to propel the vessels at a rate of 19½ knots an hour, with 140 revolutions of the engines. At a speed of 10 knots the available coal supply would enable the vessels to make a run of 2400 miles. The Troude, Lalande, and Cosmao differ but little from the above three vessels. Their engines are still under construction. The six cruisers are each to be armed with two 14-centimetre guns, three 47-millimetre quick-firing guns, and four revolver guns.

Protective deck.

Engines.

The French Chambers have authorised the construction of two additional protected cruisers. They will be armed with two 19 cm. six 14 cm., four quick-firing, six machine guns, and four torpedo tubes. They will be protected by an armoured deck subdivided by coffer-dams and water-tight compartments. Speed, 18 knots, natural draught. Coal endurance, 3000 knots at 12 knots.

GERMANY.

Protected cruisers. Irene. Prinzess Wilhelm.

Germany has recently made a few additions to her unarmoured fleet. The list includes the corvettes Irene and Prinzess Wilhelm, two smaller vessels Schwalbe type, and two gunboats Wacht type.

The Irene and Prinzess Wilhelm protected cruisers were designed by the German Admiralty and built by contract. The former was laid down at Stettin by the Vulcan Company in April, 1886, and launched in July, 1887; the latter was built by the Germania Works at Gaarden, near Kiel; she was begun in August 1886, and launched in September 1887.

Armament.

Each is armed with fourteen 5·91-inch (15-centimetre) B. L. Krupp

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guns, eight of them 22 calibres long and six of 30 calibres; the former are in broadside ports, and the latter on sponsons, four with bow and two with stern fire. A torpedo tube is fixed in the stem below the ram. The secondary battery is composed of six H. R. C. of 37 millimetres.

Engines. The contract requires a speed of 18 knots for six consecutive hours and an I.HP. of 8000 for the engines, which are designed by the contractors. They are horizontal compound, placed in separate water-tight compartments, and drive twin screws. Steam is taken from four cylindrical double-ended boilers; those of the Irene have three, and the Prinzess Wilhelm's have four furnaces each. The normal coal capacity is 600 tons, but bunker space is available for 900.

Boilers.

Coal supply.

Protective deck. The hulls are of steel, wood-sheathed and coppered below water. A complete turtle-back protective deck of mild steel is fitted, having a minimum thickness of 0·8 inch, and a maximum of 3 inches over vital parts. All hatches, &c., cut through this deck have armoured coamings and are surrounded by coffer-dams.

The berth deck is 3 feet above the protective deck; the space between them is subdivided by numerous bulkheads, forming three fore-and-aft rows of water-tight compartments. Those nearest to the sides are packed with cork and glue, forming a belt 4 feet 5 inches thick; the midship compartments are filled with coal or patent fuel; two fore-and-aft passage-ways separate the rows. On the berth deck the midship coal-bunkers are run up on and also across the ship over the machinery space.

Dimensions. The principal dimensions are: Length, 308 feet 5 inches; beam, 45 feet 11 inches; displacement, 4300 tons, with a mean draught of 21 feet.

The vessel will have two military masts, poop and forecastle, and a bridge with a 2-inch steel conning tower, from which 4-inch tubes, 2 feet in diameter, lead below.

Complement. The complement will be about 320 officers and men. The contract price for hull and machinery is £190,000.

Schwalbe. The Schwalbe is a composite cruiser, intended for service on the African coast. She was laid down at Wilhelmshaven in November 1886; launched on August 16, 1887; and completed in May 1888.

Armament. The armament is composed of 10·5-centimetre (4·13-inch) Krupp B. L., four in each broadside, the forward and after guns being on sponsons. As a secondary battery, four 37-millimetre H. R. C. are carried.

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Engines. For motive power she has compound engines of 1500 LHP., driving twin screws. Steam is furnished by four cylindrical boilers. The coal capacity is placed at 300 tons.

Dimensions. The principal dimensions are: Length, 203 feet 5 inches; beam, 30 feet 8 inches; depth, 18 feet 4 inches; mean draught, 14 feet 5 inches; displacement, 1120 tons.

Complement. One hundred and fourteen officers and men will be the vessel's complement.

Wacht. The steel despatch vessel Wacht was designed by the German Admiralty, and was built under contract by the Weser Company for £75,000. She was launched on the 27th of August, 1887.

Duchess of Pomerania. A sister to the Wacht, and named the Duchess of Pomerania, is still on the stocks.

Greiff. The Germans have recently made some successful trials of the torpedo sloop Greiff, 2000 tons, 5400 HP. It is said that a speed of 23 knots was attained. The armament includes a number of quick-firing guns. Complement 141.

Russia.

Cruisers. The construction of cruisers for the Russian Navy has been subordinated to the ironclads. We give particulars of the most important cruisers recently added to the Russian fleet.

Admiral Korniloff. The Admiral Korniloff was built by the Loire Company, and launched at St. Nazaire on the 28th March, 1887.

The dimensions and principal constructive particulars will be found in the alphabetical list. The following description is from the *United Service Gazette*, with further particulars supplied by a correspondent in Russia:—

Protective deck. "The vital parts of the Korniloff are protected by an armour deck, while the sides are also well covered, and the coal bunkers will act as a protection for the engines and machinery. The commander's post,

Conning tower. in the event of a combat, is a large ironclad block-house, in which are concentrated all the cruiser's means of action, such as the steam steering wheel, the apparatus for transmitting orders to the engine-rooms and powder magazines, and also the apparatus for the converging of artillery fire and the discharge of the torpedoes. In short, this block-house contains all that the commander of the cruiser, aided by a few of his officers, would require for the management of his ship if engaged in combat. The accommodation for both officers and men is very

Complement. spacious and comfortable, and the crews number over 400."

Below the water-line the Admiral Korniloff is lined with cocoanut

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fibre, intended to swell and fill up holes in the event of the sides being pierced by shot. The vitals are protected by a curved armoured deck and 16 water-tight bulkheads, but the hull has no double bottom. The ship is driven by a pair of 6000 I.HP. triple-expansion engines, working up to 8262, with forced draught. Steam is supplied from eight boilers, there being two supplementary boilers for other work. The official trial took place on the 11th August, 1888, when the Admiral Korniloff steamed for twelve hours on the measured mile, with eight boilers and a steam pressure of 7 to 8½ atmospheres. Beginning with 46 revolutions, the engines were worked gradually up to 76, with which a speed of 14·66 knots was attained, while 87 revolutions produced a speed of 16·41 knots. The average temperature of the stoke-hole was 113° Fahrenheit, between boilers 144°, in engine-room 106°, on deck 81°. The fuel used was Cardiff compressed coal. The machinery worked fairly well, but the supply of water to the boiler was deficient, and the donkey-engines had to be used. It is proposed to use in future the distilling apparatus, but this will diminish the supply of drinking water. The air-pumps worked irregularly, owing to some defect in the automatic regulators and want of fresh water in the condensers.

Protective deck.

Engines.

Boilers.

At the beginning of October, 1888, final trials took place at Cherbourg, and are said to have given brilliant results, 6 hours steaming averaging 17½ knots, with ordinary draught, and over 18½ with forced draught. The consumption of fuel is reported to have been satisfactory.

Final trials.

Leaving Cherbourg on the 31st October, the Admiral Korniloff reached Cronstadt on the 7th November, cutting her way through the ice in the Gulf of Finland. The speed averaged 11·35 knots, with 5 boilers, of which one was used almost entirely for electric lights, &c. The time above named for the passage included nearly 24 hours stoppage in the Belt. The ship was somewhat lively, averaging 12 and even 14 rolls a minute. The machinery worked well. Greatest number of revolutions 84, average 58. The last day, with head wind and some sea on, she made 12 knots easily. It would not appear from all this, however, that she can be fairly called a 19-knot ship. She is said to be very handy, answering the helm well and making little or no leeway. The Admiral Korniloff carries two 48 feet steam-cutters fitted to discharge Whitehead torpedoes.

Passage to Cronstadt.

SPAIN.

In recent constructions for the Spanish Navy the cruisers have been a prominent feature. The Reina Regente, built by Messrs. Thom-

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son, of Glasgow, is a cruiser of unrivalled speed, having maintained for four hours a mean speed of 20·6 knots on the measured mile.

Protective deck. The Reina Regente is protected by an armoured deck, having a thickness on the slopes of 4¾ inches, and by numerous water tight compartments.

Armament. The displacement is 4800 tons. The armament includes four 21-ton B. L. R. guns, six 5-inch B. L. R. guns, and 12 machine guns. Two similar vessels, the Alfonso XIII. and the Lepanto, are in course of construction.

Belted cruisers Of the six belted cruisers ordered for the Spanish Navy, three are to be constructed in the Government dockyards at Cadiz, Carthagena, and Ferrol. The three others have been put out to contract. The principal features of these vessels are described as follows:—

The cruisers to be built are after the type of the Australia class, of which seven were recently built in this country for the British Navy—two in Government yards and five in private establishments. Two of them—the Orlando and Undaunted—were built at Messrs. Palmer's yard on the Tyne. The displacement of the new vessels will be considerably greater—7000 tons instead of 5000 tons—length 360 ft. as

Armour belt. compared with 300 ft., and 65 ft. breadth instead of 56 ft. The vessels will have an armour belt, running for about two-thirds the length, affording complete protection to the boilers and engines,

Speed. magazines, &c. The speed is estimated at 19½ knots under forced

Engines. draught. The machinery will be of the triple-expansion type, and will be constructed from the design of Messrs. Palmer, of Jarrow-on-Tyne. The indicated horse-power is to be 15,000, as against 8500 in the Australia class.

United States.

Baltimore. In *The Naval Annual* for 1887, a brief description was given of the cruiser Baltimore. The following is taken from the United States Navy General Information Series:—

"The twin-screw, steel protected cruiser Baltimore is building at the yard of William Crump & Sons, Philadelphia, where her keel was laid May 5th, 1887.

Description. "She is a high-freeboard vessel, with long forecastle and poop deck, a strong ram bow, and a round stern covering and protecting the rudder, which is placed well below the water-line. There will be two smoke-pipes, and two masts fitted with military tops. The stem, stern-post, rudder, and shaft-tubes and struts are steel castings; the rest of the ship is built of rolled or wrought steel. There is a complete double bottom, numerously subdivided, each compartment of which has its suction connection with a steam-pump. The engine and

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boiler space is completely surrounded and protected by coal in bunkers. All the bunker bulkheads, together with the main transverse and longitudinal bulkheads, are water-tight, and all openings in them are fitted with water-tight doors or covers, thus dividing the ship into many water-tight compartments, each of which is directly connected with powerful steam-pumps.

Protective deck.

In addition to the coal protection, there is a complete protective deck, laid in two thicknesses of steel plates. The crown or horizontal part of this deck is slightly above the W. L. at normal draught, and the plates of which it is built are each 1¼ inch thick; the thickness at the knuckle, or place where the crown is joined to the inclined sides, is 3½ inches; and on the sides, which slope to 6 feet below the W. L., it is 4 inches, in two plates of 2 inches each.

The engine hatches and all other openings through this deck are fitted with plate covers of the same thickness as the deck. The smoke-pipe hatches are fitted with glacis plates and armour bars.

Conning tower.

The conning tower on the after end of the forecastle is built of 3-inch steel; and all the guns are fitted with deflective steel shields.

Armament.

The armament will consist of four 8-inch B. L., mounted on either side of the poop and forecastle on slightly sponsoned platforms, at a height respectively of 26½ and 28 feet above the water line, six 6-inch B. L. will be mounted 18 feet above the water line in broadside on the spar-deck, on sponsoned platforms, which allow of a train of 155° from the line of the keel for the forward and after pairs, and an extreme train of 130° for the guns in the waist. The secondary battery will consist of six 6-pounder R. F. G.,* six H. R. C.,† and four Gatlings.

The torpedo armament consists of five above-water discharging tubes.

The principal dimensions of the ship, &c., are given in the alphabetical list.

Speed.

The maximum speed, estimated to be developed over the measured mile at the above draught and displacement, is 20 knots with forced draught, and over 17 knots with natural draught.

Engines. Boilers.

The motive power consists of two sets of horizontal triple-expansion engines, estimated to develop 10,750 I.HP. with forced draught. Steam will be furnished by eight double-ended cylindrical boilers, in two sets, of four each.

Coal supply.

The coal supply at normal draught is 400 tons, but the bunker capacity is 900 tons. With the latter supply the ship has an endurance of about 3400 knots at full speed, natural draught, and of about 12,000 knots at 10 knots speed.

* Rapid Fire Gun. † Hotchkiss Revolving Cannon.

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Charleston.

The Charleston is a steel twin-screw cruiser of the central superstructure type, building at San Francisco, at the Union Iron Works, given to contract in January, 1887.

The ship is a reproduction of the justly celebrated Japanese cruiser Naniwa.

The stem, stern-post, rudder, shaft-tubes, and brackets are of cast steel; all the remainder of the vessel is rolled or wrought steel. The plating is of the same thickness as in the Baltimore.

The coal protection is as complete as in the Baltimore; the double-bottom and water-tight compartments have the same general arrangement, and the drainage system is as complete.

Protective deck.

The protective deck is complete, and curves from the point of the ram to the extremity of the stern. It is laid in two courses of 1-inch plates on the horizontal and 1½-inch plates on the inclined sides, giving a total thickness of 2 and 3 inches respectively.

Conning tower.

The conning tower is on the forward bridge, and is 2 inches thick on the sides, with a ¾-inch top. The loading stations for the 10-inch guns are built of 2-inch steel, and the segmental shields for the 6-inch guns are of the same thickness.

Armament.

The armament will be two 10-inch B. L., mounted on the fore-and-aft midship line, one forward and one aft. The weight is supported beneath the deck by tubes 10 feet in diameter, built of ⅜-inch steel plates. No bulwarks are fitted to the deck at the extremities of the vessel to admit of clear fire from these guns. Six 6-inch B. L. are mounted on the same deck, three on each broadside on slightly projecting sponsons, and with deeply recessed bulwarks to admit of increased train.

The high bulwarks which occupy the waist are terminated by thwartship wing bulkheads, in rear of the 10-inch pivot guns, to protect the broadside battery from the blast of the guns, and also to increase the comfort and safety of the vessel in a sea-way. The secondary battery will be four 6-pounder R. F. G., six H. R. C., and four Gatlings. Four above-water torpedo tubes will be fitted, but the number and type of torpedoes is yet undetermined. The

Rig.

two masts are fitted with a fore-and-aft rig, and each carries a military top.

Engines.

Speed.

The motive-power consists of two sets of horizontal 2-cylinder compound engines, estimated to develop 7,500 I.HP., and a speed of 19 knots with forced draught. The engines of the Naniwa developed 7650 I.HP., and gave a speed of 18·9 knots, when the ship was at her load draught, a mean of two runs over a course 9·6 knots long.

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The principal dimensions are given in the Alphabetical List of American Ships. The total capacity of the coal bunkers is 800 tons.

Newark. The Newark is a steel, twin-screw, barque-rigged, protected cruiser. Her principal dimensions are given in the Alphabetical List of American Ships.

Rig. The bow is ram-shaped, and is strongly braced and supported by the protective deck. The stern is of the ordinary elliptical shape, but the rudder is situated well underneath the water, and forward of the overhang. The sail area is 9586 square feet. The fore and main masts are fitted with military tops.

Protective deck. The steel protective deck is complete, and curves longitudinally from the point of the ram to the extremity of the stern, where it covers the steering gear. The horizontal crown is about 1 foot above the water-line, the sides sloping to about 5 feet below. The deck is laid in two thicknesses, the first being complete and ½-inch thick, the second being of 2½-inch plates on the inclined sides, and 1½-inch plates on the horizontal, increased to 2 inches over the steering gear.

Conning tower. The conning tower on the forward bridge, abaft the forecastle, is 8 feet 6 inches in diameter, and built of 3-inch steel plates. The top is 1½ inches thick. A steel communicating tube 12 inches in diameter, and 2½ inches thick, extends in one length from the protective deck into the conning tower, to carry speaking tubes, steering gear, signal wires, &c.

All the guns are to be fitted with segmental steel shields.

Armament. The armament will consist of twelve 6-inch B. L. guns, so mounted that there is direct bow and stern fire from four guns, and beam fire from six guns. The guns are all mounted on the spar-deck, at a mean height of 16 feet 6 inches above the water line. The bows and quarters are cut away to admit of fire ahead and astern from the forward and after pairs of guns, which are mounted on platforms slightly sponsoned out from the ship's sides; the neighbouring pairs are also mounted on sponsons, but with projection sufficient to give them bow and stern fire clear of the forward and after pairs. The two pairs of guns in the waist are slightly sponsoned, but have the bulwarks deeply recessed at the ports, admitting of a train of 140°. The secondary battery will be four 6-pounder R. F. G., four H. R. C., and four Gatlings. The torpedo armament is undetermined, but arrangements are made for six above-water discharging tubes, all having a train of 90°, one being on each bow, one on each quarter, and one on each side in the waist.

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Engines. The motive power will consist of two sets of horizontal triple-expansion engines, estimated to develop 8500 I.HP., and to give a speed of ship of about 18 knots.

Complement. The complement of men is placed at 300.

Coal supply. The capacity of the bunkers is 850 tons, which will enable the ship to steam about 3100 knots at full natural draught speed, or 10,700 knots at 10 knots speed.

Yorktown. The Yorktown, originally known as "Gunboat No. 1," is a steel, twin-screw vessel, very similar in general design to the "torpedo cruiser" class of the British Navy, of which the Archer is the type. She is being built at Philadelphia, at the yard of William Crump & Sons, where her keel was laid May 14th, 1887.

Rig. She has a high freeboard, long poop and forecastle decks, a strengthened ram bow, elliptical stern, the rudder placed well below the water line, and is rigged as a three-masted schooner, spreading 6353 square feet of canvas.

Protection. The only protection to the vital parts is the coal carried in the space in wake of the machinery and boiler space. Both below and above the water-tight deck the bunkers occupy all the space within these limits, except the necessary passages and hatches, and, their bulkheads being water-tight, serve to further increase the watertight subdivision of the ship. The under-water body of the vessel is divided into twelve main watertight compartments by complete transverse bulkheads.

Armament. The armament will consist of six 6-inch B. L. mounted, two on the forecastle on slightly sponsoned platforms, two similarly situated on the forward end of the poop, and one each side in the waist on the upper deck, all fitted with segmental steel shields. The forward and after pairs have a train of 160° from the line of the keel, and the pair in the waist may train through an arc of 140°. The secondary battery will comprise five R. F. G., two H. R. C., and one Gatling. Eight torpedo tubes will be fitted above water, and on the upper or spar deck. The tubes in the stem and in the stern are fixed to fire in the line of the keel, while those on the bow quarter, and in the waist have a train of about 45°.

Engines. The motive power will consist of two sets of horizontal triple-expansion engines driving twin screws, estimated to develop 2200 I.HP. with natural draught and 3200 with forced draught. (It is probable that this estimate will be exceeded by the contractors.)

Cost. The contract price is £91,000, and the vessel was expected to be completed in one year. A bonus of £20 will be paid for each HP. developed above contract figures on trial; a forfeit of £60 per I.HP.

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will be exacted if the performance of engines falls below contract requirements.

The coal capacity is placed at 400 tons, the complement of men at 150, and the maximum speed at 17 knots.

Peterel. The Peterel is a steel, single-screw vessel, building at Baltimore, at the yard of the Columbian Iron Works.

Dimensions. Her principal dimensions are: Length, 175 feet; beam, extreme, 31 feet; depth of hold from upper deck beams, 15 feet 7 inches; mean draught, 11 feet 7 inches; displacement, 870 tons. A fair amount of sail can be carried, the barkentine rig spreading 4853 square feet of canvas.

Armament. The armament consists of four 6-inch B. L. mounted on sponsons, two on each side at a height of 10 feet 8 inches above the W. L., and fitted with segmental steel shields. The forward pair is just abaft the break of the forecastle, the after pair just forward of the break of the poop, having clear bow and stern fire, respectively. The platforms on which these guns are to be mounted are raised about 4 feet above the level of the spar-deck. Two 6-pounder R. F. G. will be mounted, one on the forecastle and one on the poop; also two H. R. C. on the rail in the waist.

Engines. The motive power consists of one set of horizontal compound engines, estimated to develop 900 I.HP. with natural draught and 1350 with forced draught. This latter I.HP. is expected to give a speed of ship of 13 knots.

Boilers. Steam will be furnished by four cylindrical two-furnace steel boilers.

Coal supply. The coal supply is placed at 160 tons, and the complement of men at 100.

The Concord and Bennington were originally known as "Gun-boats No. 3 and No. 4." They are in all respects sister-ships to the Yorktown.

The contract for building them was executed on the 15th November, 1887, with N. F. Palmer, Jr., & Co.; they are to be completed in eighteen months, and the guaranteed horse-power is 3400. The contract price, exclusive of armament, is £98,000 for each. The Quintard Iron Works of New York city are building the engines. A bonus of £20 will be paid for each HP. developed above the contract figures on trial, but if those figures are not reached a forfeit of £20 per I.HP. will be exacted. The vessels are building at Chester, Pa., by the Delaware River Iron Ship-Building Company; their keels were laid in May, 1888.

Vesuvius Dynamite cruiser. The Vesuvius was originally described as the "Dynamite-gun Cruiser:" see *Naval Annual*, 1887. Since her conception she has undergone some changes; the three pneumatic tubes of 15-inch

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calibre are placed abreast and parallel at a fixed angle to the water plane of 16 degrees, the muzzles projecting through the deck at a distance of about 37 feet from the bow. The terms of the contract require that they should be able to throw a shell every two minutes, but it is claimed that they can load and fire two shells per minute, the lower sections of the tubes working on hinges to facilitate the operation. The secondary battery has not yet been determined.

Engines. The three-bladed twin screws are worked by two vertical four-cylinder triple expansion engines of about 4000 I.HP. The diameters of cylinders are HP. 21·5 inches, Int. 31 inches, and the two L.P. 34 inches; the length of stroke is 20 inches, and the estimated piston speed 930 feet.

Boilers. Steam is supplied by four three-furnace locomotive boilers 9 feet in diameter, 19 feet 8 inches long, with a grate surface of 200 square feet. The coal capacity is 140 tons.

Dimensions. The principal dimensions are: Length between perpendiculars, 246 feet 3 inches; beam, 26 feet 6 inches; depth, 14 feet 1 inch. The displacement is 805 tons, with a mean draught of 9 feet 3 inches.

Thirty full-calibre shell will be carried, each containing 600 pounds of explosive gelatine.

Gun Boats.

Gunboats, Great Britain. In the construction of gunboats England takes the lead to an extent which is to be regretted, in view of the urgent need for cruisers of a more powerful type.

Our gunboats of recent construction were described in the *United Service Gazette* of May 12th, 1888, on the occasion of the recent launch at Devonport of the Partridge, one of the vessels of the Bird class building at the various yards.

Partridge. Construction. "The Partridge, like the Pheasant, recently launched at Devonport dockyard, is a composite vessel of 755 tons displacement, and is 165 feet long, with a beam of 30 feet. All her internal fittings are of steel, and she is planked with two thicknesses of teak, two and three inches respectively in thickness. Thirty-two water-tight compartments enclose the powder magazine, store-rooms, engine and boiler-rooms, high and low coal-boxes, steam steering gear, and electric light rooms. The frames of the ship are of Z steel, securing great strength with lightness. The vessel will be propelled by a single screw, driven

Engines. by triple compound engines. The power of endurance, at a speed of 10 knots, will be 2500 knots. Every endeavour has been made to combine lightness with strength, steel being used in the construction

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of the machinery. The centrifugal circulating pumps are each driven by separate and independent engines, and are arranged so that each is capable of pumping from the bilge 175 tons of water per hour in the event of the ship springing a serious leak. The whole of the auxiliary engines, including four Admiralty pattern pumps, starting engines, two centrifugal pumps and engines, and two fan engines, have been constructed entirely in the students' shop, and, as far as can be seen at present, appear to be a thoroughly good job. Special pains have been taken to secure successful working of the machinery at high speed, all working parts having ample bearing surface, and in some cases special lubricating arrangements, notably the guide bars, which are hollow and fitted for cold water to circulate through them. The engines are completed up to time, and will be placed on board as soon as the Partridge is taken into Keyham basin.

Manufactured by engineer students.

"The vessel, when completed for sea, will cost, complete with guns, £50,000; the engines, boilers, etc., cost £8500.

Cost.

"Her armament will comprise six 4-inch breechloading guns mounted on Vavasseur central pivot carriages, two 1-inch barrel Nordenfelt guns, two 45 barrel Nordenfelts."

Armament.

The trials of the Pigmy, a sister ship to the Pheasant, were described in the *Times* of the 3rd December, 1888.

"The new composite gunboat Pigmy, 755 tons, 1200 horse-power, which has been engined for the Government by the Naval Construction and Armaments Company, of Barrow-in-Furness, brought her official forced-draught trials to a successful conclusion at Sheerness on Saturday. The whole of the machinery worked smoothly, and there were no signs of hot bearings or priming of the boilers. The *maximum* horse-power attained was 1349·5, and the average for the four hours' run was 1250 (50 in excess of the contract), the engines working at 199·5 revolutions per minute. The average speed for the four hours' run was 13·5 knots."

Pigmy.

Horse-power.

Speed.

The Goldfinch, the most recent type of gunboat, is described in the *Army and Navy Gazette* of the 6th October, 1888.

"Goldfinch, 6, 1st class gunboat, to be built at Sheerness dockyard, is to be 165 ft. in length, with a breadth of 31 ft., and a displacement of 805 tons. She will draw 11 ft. 7½ in. of water, and will be larger than the gunboats of the 'P' class, although built upon similar lines, her displacement being 50 tons in excess of those vessels. The engines are to be of the triple-expansion type, and are estimated to develop 1200 horse-power, with a speed of 13 knots per hour. She is to be provided with accommodation for the storage of 105 tons of coal, and, with the engines working at a reduced speed of 10 knots

Goldfinch.

Dimensions.

Engines.

Speed.

Coal supply.

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per hour, this quantity is estimated to be sufficient to enable her to steam 2500 knots. The armament of the Goldfinch is to consist of six 4-inch steel breechloading guns, two of which are to be mounted on the poop, two on the forecastle, and two amidships. She will also carry two 3-pounder quick-firing guns, and an equipment of machine-guns. She will be barque-rigged, and will be fitted with the electric search lights.

Armament.

Rig.

In point of seaworthiness our latest types do not compare favourably with the old-fashioned gunboats. The loss of the Wasp in the China Sea is a case in point.

In the cruise of the Channel Squadron, last autumn, the experiences of the Curlew were thus described in the *Army and Navy Gazette*, of October 16th :—

Curlew.

"Curlew, 4, gun-vessel, 1st class, Commander C. J. Norcock, one of the ships of the Channel Squadron, encountered a severe gale while on passage from Queenstown for Invergeldie. She left Queenstown on the 28th ultimo, and soon afterwards a strong gale of wind sprang up, followed by heavy, tumultuous seas. So violent was the gale that Commander Norcock deemed it necessary to reduce the speed of the ship from ten knots to five. While proceeding at slow speed the Curlew shipped a heavy sea, which caused her to heel over considerably, and also carried away her steam steering gear. She soon righted herself, however, and, so far as could be ascertained, sustained no serious damage. The carrying away of the steam steering gear rendered the management of the vessel in such weather exceedingly difficult, but she eventually reached Peterhead in safety, and, after having had some defects made good, left Peterhead on Monday to join the squadron at Invergeldie."

Rig.

Bringing the experience of an old yachtsman to bear on this and other similar incidents, I shall venture to suggest that, in the masting of the recent vessels, the assistance to be derived from the judicious use of fore-and-aft canvas may not have been sufficiently considered. Low shoulder-of-mutton sails, especially in the middle of the ship, produce a most beneficial result in checking the rolling to windward. In running before heavy gales, a storm square-sail, or close-reefed fore-topsail, is of the greatest value in checking rolling, and keeping the vessel ahead of the sea.

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IV.—TORPEDO FLOTILLA.

Torpedo flotilla.

The torpedo flotilla has become a most important element of the fighting power of a navy. The following list shows the construction actually in progress for the three principal naval powers of the class of torpedo boat catchers, or torpedo gun-boats, as we now call them.

England.—Spanker, Speedwell, Salamander, Seagull, Gossamer, Sheldrake, Gleaner, Skipjack, Sharpshooter, Whiting (for Australia), and Wiza (for Australia), all of 735 tons displacement and 21 knots speed.

France.—Vautour, Wattignies, and three other vessels of the same size and power, all of 1280 tons displacement and of 17 to 18 knots speed; two vessels of the Bombe class, of 320 tons displacement and 18 knots speed; and seven vessels of the Ouragan type, of 150 tons displacement and 24 knots speed.

Italy.—Four vessels unnamed of the Tripoli type, of 740 tons displacement and 20 knots speed, and five vessels unnamed of the Folgore type, of 317 tons displacement and 20 knots speed.

In England the most improved type of torpedo gunboat is that of the Sharpshooter class. The description is from the *Army and Navy Gazette*:—

Sharpshooter class. Dimensions. Engines. Speed. Coal supply.

"The Sharpshooter, which was laid down in September, 1887, is a steel vessel of 735 tons displacement, 230 feet in length, 27 feet in breadth, and having a mean draught of 8 feet 3 inches. Her engines, which are the work of Messrs. Bellis & Company, and which cost £19,810, are triple-expansion, driving twin screws, and are expected to develop 4500 indicated horse-power with forced draught, and to propel the ship at a maximum speed of 21 knots, or rather over 24 miles an hour. The coal capacity is 100 tons, a quantity sufficient to supply fuel for 2500 nautical miles of steaming at the economical speed of 10 knots.

Armament.

"An important feature in the new ship will be her armament, which, in addition to four torpedo-launching tubes, will include two of the new 4·7-inch 36-pr. quick-firing guns and four 3-pr. quick-firing guns. The armament as originally designed was to have been similar to that of the Rattlesnake—viz., one 4-inch breech-loader and six machine-guns—but recent trials of the heavier quick-firing guns, as manufactured at Elswick, have induced the Admiralty to substitute the armament which is given above, and which is in all respects more powerful and more satisfactory. The Elswick 4·7-inch 36-pr. Q.F.

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weighs 34 cwt., and, with a charge of 12 lb. of powder, throws a 36-lb. projectile with a muzzle velocity of 1946 feet per second, and a muzzle energy of 945 foot tons. This gives a muzzle perforation of 7·3 inches of wrought-iron, a penetration equal to that of the 4-inch breech-loader. The two guns, therefore, may be accepted as about equal in power; but the quick-firing weapon is greatly superior to the other in rapidity of action. It can, in fact, be discharged ten times a minute, whereas the other gun cannot be fired more than twice a minute. Moreover, the change in the armament enables two guns to be carried instead of one. The real measure of the improvement thus practically resolves itself into an increase in the offensive power of the ship from two to twenty discharges a minute. The 3-pr. quick-firing guns which form the secondary battery will be of the Hotchkiss pattern."

The high forecastle is a valuable feature in the Sharpshooter class. It will be of great value when lying to in bad weather, or when steaming against wind and sea.

ITALY.

Italy.

The Italians have taken the lead in the construction of a large class of torpedo cruisers. In the *Army and Navy Journal*, of New York, the following description is given :—

Dogali class.

"Four new armoured deck ships of the Dogali type have been laid down for the Italian navy. The Dogali is a torpedo ram cruiser, with a protective deck $\frac{5}{8}$ inch thick. Her displacement is 2050 tons. She is fitted with engines of 7500 horse power, which have propelled her at a speed of 20 knots. She is armed with six 15-centimetre guns and fifteen mitrailleuses. Four new torpedo cruisers of the Tripoli class are also to be built. They will have steel decks 1 inch thick, a displacement of 741 tons, and three engines of 4200 horse power, working three screws, which will give them a maximum speed of 23 knots. These screws are three bladed, and two of them are placed at the same height in the same direction as the keel. The axis of the third screw is inclined to it at an acute angle. Italian naval officers consider this arrangement very efficient, not only for the attainment of a high speed, but also for manœuvring vessels. The four vessels will be armed with eight quick-firing guns and three mitrailleuses. It has been further decided to build five torpedo avisos of the Folgore type, intended for the pursuit of torpedo boats. They will have, like her, a displacement of 317 tons, engines of 2800 horse power, a speed of 20 knots, and be armed with two quick-firing

Armament.

New vessels of Tripoli type.

New vessels of Folgore type.

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guns and four mitrailleuses. A large number of seagoing torpedo boats are also to be constructed immediately. The government dockyard at Castellamare is at present engaged on the construction of one vessel of each of the following types—the Dogali, the Tripoli, and the Folgore."

Torpedo Boats.

England supplies torpedo-boats in large numbers to foreign governments. We are in a position to meet our own requirements with a promptitude which could not be rivalled elsewhere.

The subject of torpedo-boat design has been recently dealt with exhaustively by an eminent builder—Mr. John Donaldson of the Thornycroft firm, at Chiswick—in a paper read at the United Service Institution.

In the present volume of *The Naval Annual* it is only proposed to give sketches and a few particulars of the most recent vessels which have been built in this country, and which contain all the modern improvements.

The most recent vessels built for the English Government have been entrusted to Messrs. Yarrow of Poplar. Six are of the first-class, and ten of the second class. The first-class boats are represented on *Pl. 43*, and the following are their leading constructive particulars.

First class Boats.

Length, 135 feet; breadth, 14 feet; displacement, 120 tons.

They have single screws, and triple-expansion engines. The boiler is locomotive, and it is believed it is the largest of its type hitherto constructed.

The coal bunkers extend round both sides of the boiler and machinery spaces, and there is a cross bunker before the boiler. These bunkers will give some protection from shot.

There is a bow rudder as well as that at the stern, and both steam and hand gear are fitted—the change from one system to the other being made almost instantaneously.

There are two air compressors for charging torpedoes, electric search lights, and Normandy condensers for fresh water fitted.

The fore part of the hull is covered by a turtleback, which terminates at its after-end in the conning tower. The armament consists of one bow torpedo tube, and two other torpedo tubes, which revolve round an armour-plated auxiliary steering or conning tower on the after-deck. There are also two 3-pr. quick-firing, and two machine guns.

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The speed of the first vessel on the official trial was 23 knots. She carries sufficient coal to enable her to cross the Atlantic at a speed of 10 knots.

The ashpan of the boiler is fitted with a very special arrangement by Messrs. Yarrow, which prevents the fire being extinguished by any sudden influx of water into the stokehole—a serious danger to which torpedo boats are specially exposed.

The second class boats are represented in *Pl. 43a*, and the following are the leading particulars of their construction.

Length, 60 feet; breadth at the water-line, 8 feet 6 in.; Displacement, 15½ tons.

The engines are triple expansion, and they drive a single screw. The boiler is of the locomotive type. The turtleback forward terminates in a conning tower from which the vessel is steered.

The torpedoes are discharged on either beam from a revolving discharge tube placed on the after-deck.

On an official trial of double the usual length, viz., of four hours' duration, when the boat was loaded, the mean speed was 17 knots. This was an excellent result.

First class boats for Indian Government.

Seven first class boats have just been completed in this country for the Indian Government. Three were built by Messrs. Thornycroft, of Chiswick, three by J. Samuel White, of Cowes, and one by Messrs. Hanna, Donald & Wilson, of Paisley, N.B.

Thornycroft vessels.

The vessels built by Messrs. Thornycroft are represented in *Pl. 43b*, and the following are some of the particulars of their construction.

Length	134 ft. 7 in.
Breadth	14 „ 9 „
Draught of water . . .	7 „ 0 „
Displacement	96 tons.
Ind. Horse Power . . .	1262

Boilers.

These vessels are each fitted with two Thornycroft water-tube boilers fully described at page 194 of *The Naval Annual* for 1887, with triple-expansion compound engines, and with the Thornycroft double rudder.

Armament.

The torpedo armament consists of four revolving deck tubes and one fixed bow tube, and the gun armament of two 3-pr. quick-firing guns and two 1-inch Nordenfelt machine guns.

Speed.

On trial, with a load carried of 20 tons, the first vessel, with a comparatively untrained crew, realised a speed of 21·94 knots. The second and third vessels, with trained crews, attained speeds of 23·15 and 23·25 knots respectively.

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In manœuvring these vessels with the double rudder the following were the results—

	Min.	Sec.		Min.	Sec.		
Complete circle going at speed ahead	1	24	and	1	28	port and starboard.	Circle turning.
Ditto ditto going at speed astern	1	28	and	1	47	ditto ditto.	

The vessels built for the Indian Government by Mr. J. Samuel White, of Cowes, are represented in *Pl. 43c*, and some of the constructive particulars are as follows:— Mr. J. S. White's vessels.

Length	125 ft.
Breadth	14½ „
Freeboard	4 „ 2 in.
Displacement	86 tons.
Ind. H. Power	1000

The speed with a load on board of 16 tons was 20 knots.

They are built on White's turnabout system, *i.e.*, with the after deadwood removed, and with a rudder directly before the propeller and another abaft it.

The circles were made when going ahead in 66 seconds, and going astern in one minute and three quarters. Circle turning.

The vessel built by Messrs. Hanna, Donald, & Wilson, for the Indian Government, is represented in *Pl. 43d*, and the following are some of the particulars of its construction :— Hanna, Donald, & Wilson's vessel.

Length	130 ft.
Breadth	14 „
Ind. H. Power	1000
Speed	21½ knots

The engines are of the triple expansion type, and the vessel is fitted with search light, all necessary gear for working the torpedo armament, and all the most recent improvements. She has one fixed bow torpedo tube. Engines.

There are two conning towers, at each of which are fitted two launching tubes, admitting of torpedoes being launched over either side of the vessel. There are also stands for 3-pr. quick-firing and Nordenfelt machine guns. Conning towers.

The following is a list of the torpedo boats actually building for the leading maritime powers, as far as can be ascertained from published documents:—

ENGLAND.

Six first-class boats of 120 tons displacement, and 23 knots speed.

Ten second-class boats of 15½ tons displacement, and 17 knots speed.

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FRANCE.

Twenty first-class boats of 54 to 117 tons displacement.
No second-class boats.

RUSSIA.

Two first-class boats.
No second-class boats.

GERMANY.

Twenty-three first-class boats of 85 tons displacement.
No second-class boats.

ITALY.

Thirty-two first-class boats of 84 to 110 tons displacement.
No second-class boats.

Loss of two first-class boats.

We regret to state that while making passages in the early part of 1889 two first-class French torpedo boats, Nos. 102 and 110, built from the same drawings, foundered, resulting in the loss of twenty-two lives. The immediate effect of these sad accidents has been that the remainder of the batch of fifty vessels built on the same lines as the two which foundered have been placed in the reserve with a view, it is stated, of receiving considerable alterations before they are again considered as fit for service.

SUBMARINE TORPEDO BOAT.

The submarine torpedo boat is almost a new feature in shipbuilding for war purposes; and cannot be passed by unnoticed. In *The Naval Annual* for 1887, at page 158, was given a brief description of one of these vessels. We now give a description of the Nordenfelt Submarine Boat which appeared in *The Engineer*.

Nordenfelt Submarine Boat.

"The Nordenfelt submarine boat, 'No. 4,' which was tried in the presence of Government officials and foreign attachés at Southampton, on December 19th last is illustrated on *Pl. 43e*. The form is entirely changed from the cigar or double conical shape of the preceding patterns. The cross section midships is now an exact circle, which closes as it moves towards bows and stern, passing through a double ogival or gothic arch, which narrows more and more until it ends in a vertical line forming each actual end of the boat. This form does not cause the boat to be subject to the same eccentric and dangerous effects as were produced by the cigar shape, notably in suddenly stopping when found necessary for fear of fouling some vessel, as occurred in the trial in the Bosphorus. The cupolas, or 'conning

Form of section.

Cupolas.

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towers,' shown furnish the means of entrance into the hull of the boat, and remain available for this purpose until the boat is submerged to the level of the surface of the superstructure, as shown in the highest long horizontal line in Figs. 1 and 2.

"The captain and part of the crew occupy the stern end of the boat, and the engineers the forward part; the engines are amidships. The captain can communicate with the men forward by speaking tubes, and has the working of the boat in complete control, having at his hand the gear for controlling all movements, and for revolution or stoppage of propellers, shown in Fig. 1, and for the horizontal screws shown in Fig. 2, which cause the boat to descend or rise. The crew, in fact, have no means of knowing whether the boat is on the surface or below when once the cupolas are closed, with the exception of such men who enter their heads into the glass domes at the apices of the two cupolas or conning towers. Generally, the captain occupies the stern dome, and one of the engineers the forward one, while the boat is being adjusted to any desired position. The two portions of the crew are not cut off from each other, as there is a passage over the boilers through which a man can creep. For submarine action, the chimneys are removed amidships, and covers are closed over the openings, the glass domes are tightened over the manholes in the cupolas, and the crew then are dependent on the stores of air and steam that are contained or provided for in the boat, whether on the surface or below water. This state of things has been maintained for eight hours at a time, although the boat is generally wholly submerged for only a short part of that time. The boat is adjusted for submarine action to float with the superstructure level with the surface of the water. The horizontal screws then by their revolution keep the boat beneath the surface; and, if the engines stop from any cause, the boat rises to a position in which the crew could escape through the manholes of the cupolas. Torpedoes are discharged from the bows of the boat a little above the horizontal screw. Three torpedoes are shown in Fig. 2 at the bows. Mr. Nordenfelt proposes to make much heavier torpedoes than those of the present Whitehead pattern. Thus, in attacking a ship, the Nordenfelt would have two advantages over an ordinary torpedo boat. She might expect to approach much closer before discharging her torpedoes, and thus she might hope to send two torpedoes in succession on to the same spot. This, in the case of having to effect a passage through protecting netting, would be a great advantage, as the first torpedo would open a way which would only be available for another following exactly in the same path. Then the increased weight and momentum of

Torpedo discharge.

Advantages.

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the Nordenfelt torpedo, although its speed would be less, would carry it through obstacles better than the lighter pattern.

The Nordenfelt boat has been made strong enough to resist the pressure of water to 60 ft. depth. This appears to be sufficient for all practical purposes, especially as the boat might generally be used in defending passages where the depth is not considerable. It must be apparent, however, that the physical conditions under which the boat works are novel in many respects, and call for special nerve, skill, and experience, especially on the part of the captain.

Mr. Nordenfelt subsequently made some successful experiments in the Gulf of Ismid.

The Gymnote.

The French have been giving attention to the subject of submarine boats. The Gymnote, recently built at Toulon, is described in *Le Yacht*:—

Description.

"The Gymnote was designed by M. Zede, an old friend and colleague of M. Dupuy de Lôme. The boat is in the shape of a cigar, 56½ feet long, 6 feet in diameter—just high enough to stand upright in the interior. The displacement is 30 tons, speed 9 to 10 knots. The degree of immersion depends, not upon the admission of water in varying quantities into the reservoir, but on the simple action of horizontal rudders, as in the case of the Whitehead torpedo. The Gymnote is nothing more than a great fish torpedo, propelled by electricity, and capable of keeping under way for several hours. All the interior work—steering, pumping, lighting—is done by electricity. M. Zede has been assisted in working out the design of the vessel by Captain Krebbs, who has constructed an electric engine of 55 H.P. in the workshops of the Société des Forges et Chantiers at Havre. This engine is of extraordinary lightness. It drives the screw at the rate of 2000 revolutions a minute, and its weight is only 4410 lbs."

Trials of the Gymnote.

Referring to the trials of the Gymnote, *The Army and Navy Gazette* stated that the "boat steers like a fish, both as regards direction and depth; it maintains the desired depth with ease and exactness; at full power it attains the anticipated speed of from 9 to 10 knots; the lighting is excellent; there is no difficulty about breathing; in short, says *Le Temps*, it is a complete success. 'It was a strange sight to see the vessel skimming along the top of the water, suddenly give a downward plunge with its snout, and disappear with a shark-like wriggle of its stern, only to come up again at a distance, and in an unlooked-for direction. A few small matters of detail connected with the accumulators have to be seen to; but they will not take a month.'"

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CHAPTER VI.

Shipbuilding Policy.

From the detailed descriptions of individual ships we pass to a more general consideration of the difficult and important subject of shipbuilding for the purposes of war, and first let us deal with the great controversy as to the best method of protection for ships of war.

Protection.

Protection is required at the water-line. Protection is required for the vitals and for the batteries.

At water-line.

A majority of British naval critics, led with great ability, vigour, and pertinacity by Sir Edward Reed, insist that the protection of the water-line must be secured by armour. Constructors for the most part give the preference to other methods than an armoured belt for the protection of the water-line. The views of Sir Nathaniel Barnaby have been expounded in a paper from which, by permission, copious extracts will now be given.

House of Commons Committee on the Navy Estimates in 1888.

In an emphatic paragraph, the Committee of the House of Commons on the Navy Estimates for 1888–89 press on the Admiralty the necessity of first investigating, with the aid of outside opinion, the best means of distributing the protective armour. No enquiry of this nature has taken place since 1871. The history of the former investigation is given in some detail by Sir Nathaniel Barnaby, in a paper recently prepared for the consideration of the Directors of the Barrow Shipbuilding Company.

"In January, 1871, a Committee was appointed by the Admiralty to consider the vexed questions relating to the designs of ships of war."

The instructions to the Committee ran as follows:—

Instructions to Committee of 1871, on designs.

"The requirements of modern warfare having recently rendered it necessary for the Lords Commissioners of the Admiralty to consider, and in some cases to adopt, various designs for ships of war of a novel character, my Lords, bearing in mind the great importance of securing for the ships which are to form part of the Royal Navy the highest attainable efficiency, have determined to ask the advice and assistance of a special committee, consisting of the following persons, in whose professional and scientific qualifications they have

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confidence, and to whom the designs hereinafter mentioned will be referred for opinion and report:—

"Lord Dufferin and Clandeboye, K.P., K.C.B., *Chairman.*
Sir William Thomson, LL.D.
Admiral George Elliot.
Rear-Admiral Ryder.
Rear-Admiral Hornby.
Rear-Admiral W. Houston Stewart, C.B.
Rev. Dr. Woolley.
Professor Rankine, LL.D., F.R.S.
W. Froude, Esq., F.R.S.
Captain Hood, R.N.
Captain Goodenough, R.N.
G. W. Rendel, Esq., C.E.
Peter Denny, Esq.
G. P. Bidder, Esq., C.E.
T. Lloyd, Esq., C.B.
Lieutenant-Colonel Pasley, R.E., *Secretary.*"

In the following July the Committee reported.

After dealing with the several types and classes of ships which had been specially referred to them, they said:—

Sir William Armstrong's letter.

"Sir William Armstrong, in an important letter which he addressed to Lord Dufferin on the 3rd of March, and of which a copy is annexed, says:—'Even now the Elswick Company would not hesitate to accept orders for rifled guns of 14 inches calibre, throwing

Rifled guns.

shot of half a ton weight with a charge of two hundredweight of powder, and to pledge their reputation on the success of the undertaking.' He adds, that 'there are good reasons for inferring that no thickness of iron less than 20 inches, supported by a backing corresponding to that used in the Hercules, would have any chance of offering the required resistance' to such a gun. Another very

Sir Joseph Whitworth's views.

eminent authority, Sir Joseph Whitworth, in the paper with which he has favoured us, says that he is prepared to undertake to make a gun of 11-inch bore which shall penetrate armour 16 inches thick at 1000 yards, and that, for protection against a 13-inch bore gun, the armour would require to be not less than 24 inches thick.

Committee's opinion.

"We see no reason to doubt that it is within the resources of science to construct guns of the power described, whilst it is certain that no first-class sea-going ship of war of manageable size can be made to carry *complete* armour protection of anything like 24 inches in thickness, nor do we feel at all confident that even this thickness,

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if attained, would permanently continue to be impenetrable. It remains, then, to consider whether, when these probabilities become accomplished facts, ship armour will retain any value, or whether it ought not rather to be abandoned as a mere costly encumbrance.

Sir William Armstrong on armour question.

"Sir William Armstrong contemplates and recommends the reduction of armour plating to a minimum, or even its total abandonment. His opinion, and the grounds on which it is based, are entitled to great respect, and have received our best and most careful consideration. But we have found ourselves unable to arrive at the same conclusion.

Armoured *versus* unarmoured ships.

"After making every allowance for the disadvantages that attend the use of an enormous dead weight of very costly armour, which, after all, is not absolutely impenetrable to certain special guns, we cannot lose sight of the indisputable fact that in an action between an armour-clad and an unarmoured ship (assuming that they carry guns of equal power), the former has, and must have, an immense advantage in being able to penetrate the sides of her adversary at a distance at which she is herself impenetrable; and, further, in being able to use with effect those most destructive projectiles 'common' shells, which would fall harmless from her own armoured sides.

Use of armour should be continued.

"Even assuming that absolute impenetrability to shot proves to be unattainable, it is still our opinion that the time has not come to throw off armour altogether, but that it is necessary that the first ranks of our ships of war should continue to carry armour of as great resisting power as possible.

"Before quitting this part of our subject, we desire to remark that, although, as before pointed out, there are serious difficulties in the way of increasing to any very material extent the thickness of armour applied in the usual manner to sea-going ships, viz., in the form of a complete belt around the ship from stem to stern at the water-line, besides local protection for guns, men, &c., it is not by any means certain that some method may not be devised of securing the requisite reserve of buoyancy by other means than armour plating. Were this accomplished, the area of the armour might be diminished, and its thickness increased in a corresponding degree. The ship would then comprise a very strongly plated central citadel, surrounded and supported by an unarmoured raft constructed on a cellular system, or containing some buoyant substance such as cork, which, without offering any material resistance to the passage of projectiles, would not be deprived of its buoyancy by penetration.

Other means than armoured possible.

Central citadel ship and unarmoured raft.

"In the absence of any practical experience of the effect of large

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shells or of torpedoes upon such a structure as that which we have in view, it is impossible to say with confidence that the object aimed at would be thus attained; but, if it were, consequences of so much importance and value would follow, that we think it right to indicate this line of enquiry as worthy of experimental investigation.

"The anticipations of the Committee as to the increase in artillery power were fully realised.

"As a matter of fact, the thickest and best armour in any ship is, according to official estimates, perforable by all guns exceeding in power the French guns of 51·8 tons.

"Between 1871 and 1885 the growing power of the gun made it appear to all designers of war-ships to be desirable to remove the armour from the front of the broadside batteries in the designs of even the largest ships. The gun was so superior in power to any armour which could be spread over the sides of the ship that it was thought better to have no armour than to have frightful *débris* driven into and across the batteries from the wreck of the defending walls.

Batteries left unarmoured in largest ships.

"But the surrender of the armour on the faces of the batteries encouraged the attack of quick-firing guns and of light shells. These would have been comparatively powerless against even thin armour.

Effect as to quick-firing guns.

"Against the unarmoured sides of the large battle-ships they are now very formidable.

"Then came melinite and dynamite shell, which were difficult to explode behind armour, but which could be sent through unarmoured sides to burst among the guns at the batteries with most destructive effect.

High explosives.

"In view of this attack by quick-firing guns and by high explosives in light projectiles, the French have reverted to armour on the batteries of two of their latest ships; and this is their answer to the question of the Committee of 1871.

French revert to battery armour.

"They say armour cannot be abandoned—the fiery rain of small shell, and the volcanoes of melinite and dynamite cannot be endured in the batteries.

"They were prepared to accept the wreck of the armour under the pounding of heavy projectiles, rather than the enemies which the unarmoured sides have called into existence.

"The Committee, when they put the question referred to above, declined, as we have seen, to accept the abandonment of armour for the guns.

"Their argument is as perfect to-day as when it was written. We have only to put for 'common shell' the names of the modern projectiles which have compelled the French to use armour again.

Committee's views still hold.

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"The Committee were distinctly in favour of the retention of armour for the purposes for which it was first introduced, viz., to protect the guns' crews against shell fire.

"What they were doubtful about was the use of a complete belt of armour at the water-line.

"For this they suggested a substitute. They considered that it was not by any means certain that some method may not be devised of securing the requisite reserve of buoyancy by other means than armour plating. Were this accomplished, the area of the armour might be diminished and its thickness increased in a corresponding degree. Raft body.

"Now let us see what has been done in England, and in France particularly, in view of these recommendations of 1871.

"France has taken the following course in her largest ships:—

"(*a*) Removed the armour from the sides above the belt, and thrown the batteries open from end to end of the ship to the lightest projectiles.

"(*b*) For the heaviest guns the French Navy has protected the revolving and elevating gear and magazine communications by armour; but has not protected by armour the men who load the guns, nor the breech of the gun at the moment of loading.

"(*c*) France has continued the use in the largest ships of a complete belt of armour from stem to stern at the water-line.

"Great Britain has acted differently:—

"(*a*) Armour has been removed from the sides above the belt, but is retained at the ends of the batteries to protect them from raking fire. There are armoured bulkheads or traverses across the batteries of all the large British ships. In two of the most recent large ships, Victoria and Sans Pareil, there is thin armour on the sides over the secondary battery.

"(*b*) In the heaviest guns the loading party and the breeches of the guns are always protected by armour.

"(*c*) An attempt has been made to secure 'the requisite reserve of buoyancy by other means than armour plating.' The belt of armour has been retained, but it is incomplete, and does not cover the ends of the ship, and in these ends the 'other means' referred to by the Committee have been adopted.

"In order to make this somewhat difficult matter clear, let us thoroughly understand what an armour belt is.

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Armour belt.

"It is a belt on the sides of the ship, covering that portion of the skin of the ship which would be alternately wet and dry as the ship pitched and rolled and heaved in a moderate sea; it is the portion of the ship otherwise said to be the part "between wind and water.

Its extent.

"It rises some three or more feet above the water in a very large ship, extends some 6 feet under water along the middle of the ship, and should be still farther under water at the bow and stern.

"As a matter of fact its depth at the stern is always less than it is amidships—a grave defect in armour belting, which is universal and incurable.

"With this arrangement of armour it is considered that there will generally be difficulty in planting a shot below the belt.

"I have myself seen hundreds of feet of the bottoms of large ships, below their belts, as they have slowly lifted in an Atlantic swell, and quick-firing guns may be expected to find out this weakness.

"Above the belt the whole area of the deck which bounds and connects its upper edges is exposed to depressed or plunging fire. Such shot perforating the deck within the 8000 or 10,000 feet of its area, may find some vital part. This deck is therefore made as strong as possible.

Position of thick deck.

"Now, according to the view of the Committee, this strong deck might have been at the lower edge of this alternately wet and dry belt—the water zone. It would be safer there, as against attack from above; and it might be covered by a solid mass of some packing material, 'some buoyant substance, such as cork,' as they say.

Packing.

"This would then form a solid mass, say 9 feet thick in places, extending from the under-water deck to some point above the water-line. Penetration of this by projectiles would lead to the admission of water into the channels they formed in the packing material.

Effect of shells on packing.

"So far as such channels or furrows were below the water-line, the water admitted would necessitate an infinitesimal farther immersion of the ship so as to preserve the same total displacement of water as before. Shells would on bursting blow out masses of the raft, and, when these holes or depressions filled with water, there would be a corresponding increase of immersion.

Loss of buoyancy.

"The practical retention of the buoyancy and of the original water-line of the ship would depend upon the relation between the bulk of the whole raft and the bulk of the holes made beneath the water-line into which the sea could find its way.

"There would be some 30,000 cubic feet of the material in a war-

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ship of moderate size; and four holes, each 5 feet square and 3 feet deep, would only be 1 per cent. of this, if the material were one-fourth the weight of water, as it might be.

"In the large British ships with unarmoured ends, this is the principle adopted in those ends, but with the variation I am about to describe.

"The under-water deck dips down beneath the water at the ends much farther than the belt would, and upon it is stowed fuel and stores, and in some of the ships cork also.

"I have long been of opinion that, if a suitable packing material could be obtained, the vacant spaces in these unarmoured ends should be solidly filled in, so that there would be a practically invariable water-line so far as ordinary projectiles from guns could affect the the ship.

Uncertain extent of sinkage.

"The element of uncertainty as to what precise number of inches the ship would be further immersed if she were badly damaged at the ends is disagreeable, and many sailors appear to be dissatisfied with the perfectly true statement that it cannot exceed a given definite number.

"Let us consider in which way the improvement in rapidity of fire and in the explosive power of shell has affected this water zone.

"I. It has made the entry of water through unarmoured parts of the water zone, by way of shot holes, more imminent.

"II. It has made it so necessary to defend the batteries that there is more need than ever for giving side armour over the water zone a secondary place, and for endeavouring to substitute another system for side armour at the water-line.

Woodite.

"To meet this necessity, a material has been devised at my suggestion by the Woodite Company, which has the following characteristics:—

"I. It can be made so as to absorb water so slowly that in twenty-four hours not more than 4 per cent. of water can enter a space which is occupied by it.

"II. It can be delivered in blocks weighing less than 16 lb. per cubic foot, whereas salt water weighs 64 lb. per cubic foot.

"III. It does not appear to be subject to any natural causes of decay.

"IV. The present price of the packing is very reasonable, and the materials of which it is made are so accessible that a large demand is not likely to increase the price, but rather to sensibly reduce it.

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"An experiment has been made by the Naval Construction and Armaments Company, Limited, at Dartford, which proves that the packing does not take fire from the exploded powder in a bursting shell.

"In my opinion this new material meets the requirements indicated by the Committee in 1871 better than anything hitherto produced.

"Supposing it to be admitted generally that this material may be stowed solidly above a shot-proof deck, with wide wings of it in cells rising 5 feet above water at the sides, we may then turn our attention to the protection of the batteries.

"How is this to be done?

"(*a*) It may be done by armour. The French are putting 4-inch armour over their batteries in ships of 7000 tons displacement. This will have the immediate effect of paralysing the quick-firing gun of the smaller sizes, but the heavier calibres of the quick-firing variety will penetrate this thickness even now.

It also explodes the melinite shell on contact, and thus prevents explosion between decks; but, the shock of discharge being kept under control, the new delayed-action fuze will suffice to carry the unexploded shell between the decks.

The 4-inch armour for the purpose is already obsolete before the ships are finished.

"(*b*) The batteries may be protected by the superiority of their fire over that of their adversaries.

Where the batteries are large and roomy, and the gunners are not crowded, this appears to me to be the natural and proper defence.

Where the ships are small, and where the batteries are confined, it is not so, and armour must be used, as in the design described below.

"(*c*) By multiplying the ships and losing sight of the individual ship in the number, and in the separation of the independent batteries and commands.

By ceasing to consider each ship as a champion or paladin, on whose safety the fate of the nation depends, and to regard such ship as a mere trooper would be regarded in a regiment of cavalry."

Design of battle-ship.

Sir Nathaniel Barnaby proceeds to describe in outline a ship of 3200 tons displacement, with a speed of 17 knots, armed with two 22-ton guns, and protected by an under-water deck. Four such ships

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could be built for the cost of a ship of 12,000 tons, or five for one of the new ships of 14,000 tons.

With great vehemence of language another writer, of equal authority and status in the profession, has presented a diametrically opposite conclusion to that to which Sir Nathaniel Barnaby has been brought. To take armour from the sides and to place it about inside a ship was, in the view of Sir Edward Reed, to build vessels which he characterizes as preposterous. Such a system is the work of dunces. Such ships are doomed to fall an easy prey to the enemies of Britain. Little guns can sink them by merely attacking the unarmoured parts.

Sir E. J. Reed's views.

It is an easy task for Sir Edward Reed to show that our ironclads are but imperfectly protected. The task would be equally easy in the case of the ships of foreign nations, if they were examined with the same searching and scathing criticism. The distribution of armour, as we find it, for instance, in the French navy, is very far indeed from giving perfect protection. In the French ships, the weight absorbed in the belt leaves little armour for other parts of the vessel, which would be crowded with men, and would be much more likely to be struck than the region near the water-line.

In the section of the present *Annual* which deals with guns, Major Orde Browne remarks on the exposed position of the crews of all the heavy guns in the later types of French battle-ships.

"The gun detachments in the turrets of the Inflexible are safe indeed compared with the gunners on board the Amiral Duperré, where barbettes expose the men's heads and shoulders completely to machine gun fire, while the men working the broadside batteries, although protected from most machine guns, are more likely to suffer from quick-fire guns and shrapnel than if they had no iron ship's side in front of them."

Major Orde Browne's views.

As a practical illustration of the impossibility of producing an impregnable ironclad, let us take two plans of the Courbet, (*Pl. 70*), and of the Formidable (*Pl. 66*), two recent additions to the ironclad fleet of France. It will be seen how small is the area of these ships which is protected by armour; and, bearing in our recollection the helpless condition to which the Huascar was reduced while the water-line remained intact, we may picture to ourselves the effect of long exposure to a heavy fire in the case of the Courbet and the Formidable.

Courbet and Formidable.

The use of cellulose, or cocoa-nut fibre, in our ships, as a means of protection, has been strongly condemned. In France the new material is growing rapidly into favour. The powerful and heavily armed

Cellulose.

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French protected cruisers are to be rendered practically unsinkable by the use of cellulose. In the French armoured gunboats of the Acheron type it has been decided to remove the plating at the water-line at the ends of the vessels, and to substitute cellulose. It is reported that an expenditure of £40,000 has actually been sanctioned for the purchase of this material.

Italian ships.

The Italians have no vertical side armour, even in their battle-ships; and in the Sardegna the displacement has been carried to 14,000 tons. The Italia and the Lepanto are nearly of the same size.

French ships.

For cruisers of the largest tonnage methods of protection other than vertical side armour are accepted in all navies. The French are building the Cécille of 5766 tons, and the Tage of 7045 tons, each armed with sixteen guns, but both without side armour, although the weight of material used for purposes of protection is in each case greater than in the Gloire, a vessel smaller than either of them, but with 4¾ inches of side armour.

The introduction of a narrow belt in our cruisers lately built of the Aurora type was discussed in the *Engineer*, in an analysis of the paper read by Mr. Biles in April, 1887, before the Institution of Naval Architects, on "The comparative effects of belted and internal protection upon the other elements of design of a cruiser."

Belted and protected ships compared.

The comparison made in the paper was between the belted cruisers of the Aurora type designed by the Admiralty, seven of which had been built, and several imaginary cruisers of the internally protected type. It may be remembered the dimensions of the belted cruisers are—length, 300 feet; breadth, 56 feet; depth, 37 feet; draught of water, 21 feet; displacement, 5000 tons. In the first design of protected cruiser, compared with the belted cruiser, it was assumed that the length, draught of water, armament, protection on the flat of the deck, stability, speed, and coal supply were to be the same in the two cases, and it was shown that there was enough available displacement to spare in favour of the internally protected type to add either 40 per cent. to the protection, or six-tenths of a knot of speed, or one large and two small guns, the actual displacement of the internally protected ship being 4790, as compared with 5000 of the belted ship. On the assumption that the displacement of the two should be the same, it was shown that a knot and a half of speed could be gained in the internally protected type, or, in other words, the adoption of a belt meant a loss of a knot and a half of speed in two ships of the same displacement. But the belt, it was shown, involved a great additional cost, and, on the basis of the same first cost for the two types, a vessel of the internally protected type could be built with

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20 per cent. more protection on the slope, 50 per cent. more on the flat of the deck, two more guns of the heaviest calibre, 50 per cent. more coal supply, and a knot more speed.

In the following table are placed side by side the principal particulars of two vessels representing the two systems :—

	Reina Regente.	Aurora.
Length	317 ft.	.. 300 ft.
Breadth	50 ft. 7 in.	.. 56 ft.
Depth	32 ft. 6 in.	.. 37 ft.
Draught, mean	20 ft.	.. 21 ft.
Displacement	4800	.. 5000
Thickness of belt		10 in.
Thickness of backing ..		6 in.
Top of belt above or below water	12 in	.. Above. 1·6
Bottom of belt below water	6 ft.	.. 4·6
Length of belt		200 ft.
Thickness of deck	4¾ in. at side 3⅛ in. at centre	2 in.
Armament	4 9·6-in. guns 6 5-in. guns	.. 2 9-in. guns. .. 10 6-in. guns.
Coals, normal	600	.. 500
Coals, full	1300	.. 1000
Speed	20·6	.. 19
I.H.P.	12,000	.. 8500

As a layman, I have no desire to engage in the battle which has so long been raging between the advocates of side armour and the advocates of horizontal or deck armour. The only type which can be completely covered with stout armour is the monitor type; and the monitor, though the best for coast defence, is not, by reason of its low freeboard, habitable as a sea-going ship. The wisest solution of the problem may be found in a judicious combination of the armoured belt with the armoured deck and the raft. The relative advantages of the belt and the deck will be determined by considerations of economy of weight. Amidships the belt, towards the ends the deck, offers the greater advantage.

Subdivision of ships.

In addition to protection by armour, ships should have the greatest possible number of compartments not communicating with one another. Every heavy gun must be protected with heavy armour—say, 12-inch armour. Whatever be the means of defence adopted for the water-line, it is only by armour that protection can be given to the batteries. In view of the terrible development of the power of quick-firing guns, it has become imperative that as much of the weight disposable for armour as possible should be applied to the defence of these batteries of light guns, which, in action, must be crowded with men, and which, in the modern ships, are left exposed to a murderous fire.

Armour on batteries.

Armoured traverses.

As a protection to the vitals from a raking fire, armoured bulkheads,

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near the bow and stern, would seem an essential feature in any method of protection. The absence of such bulkheads is a weak point in the French ships.

Compiler's views as to the kind of ships which should be built.

At the time when the Inflexible was in progress the compiler strongly advocated the construction of ships of a less displacement. He has seen no reason to change the opinion then expressed. The compiler is no advocate for the construction of second-class vessels by a first-class Power. He would deprecate the construction for the English line-of-battle of ships of slow speed, thinly armoured and weakly armed. He would, however, observe that while the improved and large types proposed by the Admiralty are probably the best that could be designed for naval combat with the gun, they cannot be equally recommended for doing battle with the torpedo and the ram. Side by side with the big gun-carrying ships, auxiliary vessels should be laid down, their vitals well protected by armour, their only weapon the ram and the torpedo, the latter fired from stoutly armoured positions. The heavy ships would be greatly strengthened, and at a relatively small cost, by armoured torpedo-ram auxiliaries. If the big ships should be built, so also should the small. If the gun is the first of naval weapons, the ram and the torpedo should not be neglected.

Torpedo rams.

Disuse of sails.

We pass from protection to a less difficult topic. It is painful to an old yachtsman to watch the rapid disappearance of spars and sails from the ships of war of all nations. The modern view of this subject is well put in an article taken from the *Army and Navy Journal* of New York.

"It is not to be denied that there is a certain amount of sentiment connected with the retention of sails, and that there is a question that with their abolition the 'true and tarry seaman' will disappear. But there need be no fear that seamanship, and that of a high type, will be required in the future to perform the various duties that will be necessary to make the battle-ship of the day as formidable to her enemies as was the line-of-battle-ship of the past. If it should be feared that a race of seamen trained in sailless ships will be wanting in courage, a glance at the deadly character of the instruments of destruction with which they have to deal should dispose of this thought. A recent writer has playfully suggested that it might be well to set the men to 'hammer sensitive fuzes into filled shell,' if it were desired to provide them with what might be considered an employment sufficiently dangerous to train them to courage.

"The feeling that sail exercises should be reduced to a minimum, and that sail power must yield to the inevitable, is growing very

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rapidly in the English navy. On the occasion of two recent lectures before the Royal United Service Institution, one on 'Mastless Ships of War,' by Captain Fitzgerald, the other on 'The Composition of a Modern Fleet,' by Commander Campbell, there was almost entire unanimity in this regard by both writers and speakers, one well-known officer going so far as to say that 'sails were sinful.'

General agreement as to sails being obsolete for war ships.

"In our own service the problem is, of course, somewhat different; but, with the possibility of petroleum as the fuel of the (not distant) future, the necessity for sail power will grow still less than at present is the case. Machine and quick-firing guns would make short work of those who should be unfortunate enough in time of action to be exposed while 'fishing the foremast' or answering the call of 'port main rigging shot away.' Though our new vessels will show a diminution of sail power, yet the square rig is dying a very lingering death; let us hope that some action on the part of the Navy Department will soon put it out of its misery."

Sail power necessary for vessels used for the police of the seas.

While sail power is undoubtedly a thing of the past for battle-ships and their auxiliaries, it ought not to disappear in cruisers for the police of the seas. The small cruisers, which may from time to time be required to make long passages, should be efficient under sail. We have a recent instance of the helpless condition to which a small vessel wholly dependent upon steam may be brought. The *Army and Navy Gazette* recently published a letter from a correspondent, describing the arrival of H.M.S. Firebrand at Manilla, thirty days out from Singapore, and twenty-three from Labuan, without coal or water, and with only ten days' provisions remaining on board.

In concluding the present chapter, we may offer a few observations of a general character. And, first, it is admitted by every authority that it is beyond the ingenuity of man to contrive a perfect, that is to say, an impregnable ship of war. If we turn to the ablest experts in the French navy, they tell us, in the words of Admiral Bourgeois, that "sur la mer rien n'est absolu; on a seulement des chances." If we turn to the officers in our own service who have given the fullest consideration to these questions, we are cautioned, to use the words of Captain Fitzgerald, that the utmost that can be accomplished is to insure to ourselves the greater number of chances. "We must ever bear in mind that it is simply a question of chances. There is no absolute safety possible, nor anything approaching it, in any design of war-ship."

On the sea one has only chances.

The best we can do for the British Navy is to strengthen it with every weapon. The gun, in the view of our best authorities, is still the principal weapon of the Navy. It has the longest range and the

Gun the best weapon.

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surest aim, and is the least affected by the varying conditions of weather at sea.

The armament which will be found the most effective will consist, not of a few guns of the heaviest calibre, but of many guns of moderate calibres. This, at least, is the conclusion drawn by the compiler after hearing the arguments on both sides as put with such clearness by Mr. White in his paper read at the Mansion House.

Torpedo.

"There are not wanting advocates of the view that the risks of failure incidental to these mechanical appliances are too serious to be accepted, and that guns have outgrown the necessities of the naval service. They point to the comparatively long time occupied in loading a very heavy gun, to the unavoidable uncertainty of naval gunnery, and to the enormous value of a single discharge, which may mean a 'miss.' They consider that for the naval service a much greater number of lighter guns would be preferable, because of the increased number of discharges possible in a given time, and the consequent increase in the number of hits. They draw attention to the fact that comparatively light guns of long range and great accuracy, which can be worked by hand, are capable of perforating most of the armour carried by war-ships at the range which is considered a fair fighting distance; and that on the large unarmoured areas of most armoured ships the shell fire of lighter guns (including quick-firing and machine guns) would be effective. On the other side of the debate it is urged that in active service so many circumstances make against the effectiveness of gun fire that a large margin of power is desirable; that a single successful shot or shell from the heavier guns would produce enormous damage; and that the association of a powerful secondary armament with the heavier guns fully meets the case. Having stated both sides, I leave the matter, only adding that in the latest ships, both English and foreign, while heavy guns are to be carried, they are not the *heaviest* available."

The ram.

The French navy has produced many able writers on naval strategy. All describe the battles of the future as a succession of charges by the opposing ships. If this be the mode of fighting, our superiority in manœuvring qualities will be of primary importance. The ram will probably do more than the gun to decide the result. In fighting with the ram small ships must have a decided advantage over big ships.

As the Navy must be armed with every weapon, so it is necessary that ships of all the effective types should be included in our programme of building.

In the construction of ships for the purposes of war, it is inevitable that the best design should be a compromise. After years

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devoted to the consideration of the conflicting views of experts, the dominant feeling in the mind of the compiler is one of sympathy with the Government, which has to take a decision upon the expenditure of vast sums of public money, under the guidance of counsellors widely divided in their views. It is some relief to know that the administrations of other powers are in the same difficulty, and that, of all the battle-ships built since the introduction of armour, there is not one which, being in sound condition, can yet be regarded as obsolete.

Armoured torpedo ram.

In the programme of shipbuilding lately propounded by the Government, the armoured torpedo ram has not been included. The type has been strongly advocated by officers of much experience in war.

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CHAPTER VII.

I.

The New Shipbuilding Programme.

HAVING reviewed the shipbuilding of the past year, we are brought to a consideration of the extended programme submitted to Parliament by Lord George Hamilton in the present Session.

The plans and the circumstances which have led up to the proposals of the Government will be most satisfactorily explained by reproducing the speech delivered by Lord George Hamilton in the House of Commons on 7th March, 1889. As reported in the *Times*, he said:—

Lord George Hamilton's speech.

"The resolution which I shall have to propose clearly brings to the mind of the Committee the object with which it is made. It is made for the purpose of giving effect to repeated declarations made by different members of the Government that the time has now arrived, in their judgment, for the survey of our naval establishments with a view of materially increasing their strength. Four years ago an almost similar motion was made by the First Lord of the Admiralty under the Administration of the right hon. member for Mid Lothian. Lord Northbrook then proposed largely to augment the normal shipbuilding programme, to add to the number of guns, and generally to make large additions to ways and means. That programme, which has been known as the Northbrook programme, is practically complete. I wish to say nothing about it except from an administrative point of view. The peculiarity attending its execution has been that ships have been built much more rapidly than it was anticipated they would be, and they have been kept waiting in some cases for months and in other cases for years for guns or gun-carriages and machinery. I think we shall all agree that one of the first duties of any one connected with naval administration is to try and reduce to the smallest limits the amount locked up in incomplete and useless ships. There can be no object in accelerating the shipbuilding process if ships are to be kept waiting for long periods of time for their guns. Therefore, early last year my right hon. friend the Secretary for War gave very close attention to the subject, with a

Lord Northbrook's programme.

No object in building ships quickly if they have to wait for their guns.

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view of ascertaining how far the existing block was capable of being removed, and how far the causes which tended to produce it were preventible for the future. If the naval progress during the last two years has not been so rapid as some of my hon. friends would wish, it was due to a block on the road, through the road being too narrow, and the widening of the road to accommodate the increase of traffic was clearly the duty to be undertaken. We have now widened the road, and I believe I may with confidence say we are able to push on our work with regularity and expedition. Now, in addition to these vessels, which are comprised in the Northbrook programme, a considerable number of other vessels have been laid down and completed during the last three years. But there is a particular class of vessels to which I must allude. I may say the magnitude and ubiquity of our commerce forces us to perform on the high seas almost single-handed many police duties, and for the purpose of performing them and protecting the smaller currents of our trade along the coast smaller vessels have to be employed of light draught and slow speed; and these vessels are useless for effective war purposes. To replace these obsolete vessels by a limited number of efficient gunboats has been one of the duties performed during the last three years; and we have built sufficient to supply that branch of the service for several years to come. Therefore the money to be devoted to the increase of shipbuilding in the construction of new ships for years to come will be solely devoted to vessels which are designed for war purposes alone. On the 1st of April, 1889, we shall have in process of building in our dockyards and by contract about 30 vessels, and on the 1st of April, 1890, we shall have completed all those vessels except four, and those four will be in a final stage of their construction. Therefore it was evident early last year that it would be our duty to submit a new shipbuilding programme to this House to take the place of the Northbrook programme which is practically complete. Early last summer Her Majesty's Government took into consideration the bases and the principles upon which the new shipbuilding programme was to be founded. It had been declared, I think, on all hands, that although we had made considerable progress during the last three years, yet our naval establishments had not attained the strength at which they should be permanently maintained. I have endeavoured in the past to give effect to the Northbrook programme by concentrating our attention on the ships and work which we had in hand, adding to them the vessels which were most urgently required, but taking care every year that the new ships completed and ready for commission were largely in excess of the old vessels which became obsolete—that is, to put into the Navy a good deal

Block as to guns.

Gunboats for police purposes.

New ships built for years to come will be for war purposes only.

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Putting more into the Navy than is taken out of it.

more than we took out of it, and so to build it up towards the level at which we thought it ought to be maintained. Her Majesty's Government had to consider whether this should be the principle on which the new programme should be based. There was an alternative on which to base our programme, and that was, after a full survey had been made of the requirements of the Navy and of the country, and having ascertained what the deficiencies were, to do our best to make them good with all the rapidity which was consistent with good construction. Her Majesty's Government determined to adopt that principle and our new shipbuilding programme is based upon it. Undoubtedly it is an advance—at least I think I may say it is a departure from the principle on which or the methods by which preceding shipbuilding programmes have been distinguished.

Basis of the new programme.

Doctrine that expenditure should be regulated by the experts.

It is frequently maintained that the Army and Navy expenditure of the country should be regulated by the opinions of experts whose services are at the disposal of the Government. That is a doctrine in which Her Majesty's Government cannot acquiesce. An essential portion of the responsibility of the Executive Government of this country is the making of the needful provision for our naval and military requirements. The responsibility of initiating increase of expenditure upon those services must rest upon the Government alone. I do not believe it would be possible, and certainly it would be most improper, for any Government to attempt to shirk that responsibility by endeavouring to shelter themselves behind the opinion of their professional advisers. But when the principle of future expenditure has been settled it is clearly the duty of the Government to take the advice of their professional officers in order that the increase of expenditure may be so formulated as to be of the utmost use in increasing the efficiency of the services to which it is to be appropriated. Therefore so soon as we had settled the principle on which the shipbuilding policy was to be based directions were given to our naval advisers that they were to prepare in accordance with the principles laid down some scheme of shipbuilding. Since then a good deal has happened; but the scheme which was then drawn out on the foundation I have mentioned is in many respects practically the scheme which I am about to lay before the House. In the interval Her Majesty's Government have given their constant attention to this question, and in many particulars and in some important particulars the scheme has been modified during the last six or eight months. I should like to acknowledge publicly the very great assistance which we have received from our naval advisers in the preparation and elaboration of the scheme I am about to unfold. The first and foremost of these advisers is Admiral Sir

Government responsibility.

When professional advice must be taken.

A tribute to the naval advisers.

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Arthur Hood, whose immense technical knowledge and, in my judgment, intuitive administrative capacity have not only in this instance, but ever since I had the honour to be associated with him, been of enormous benefit to the naval service. (Hear, hear.) It is rather a curious coincidence that there was another body quite independent of Her Majesty's Government considering the principles upon which the shipbuilding programme would be based. Last year the House appointed a Select Committee, over which the right hon. member for the Stirling Burghs has presided with his characteristic common sense, impartiality, and ability. That Committee was composed of men of every section of political opinion in this House. We differed on a good many matters, but there was a proposition to which that Committee gave a unanimous assent, and it was to this effect—that any new shipbuilding programme should be based upon a full survey and knowledge of the whole requirements of the naval service of the country. This recommendation of the Select Committee was arrived at some months after the decision of the Government, and it is a curious coincidence, because it shows that so far from this increase of naval expenditure which we advocate being necessarily associated, as some think it is, with the traditions and predilections of the Tory party, a body of men specially appointed to consider questions of naval expenditure, and temporarily disassociated from their political prejudices, have arrived at identically the same conclusions as have Her Majesty's Government. I should like to lay before the House some considerations which influenced us in arriving at the conclusion that an increase of naval strength was necessary. Our commerce has greatly increased during the past few years, and it will continue to increase, but it does not follow that the increase of naval expenditure should be proportionate to the increase of commerce. The examination of a few figures will show that the increase in tonnage is greatly due to the enlargement of the size of vessels rather than to an increase in their number. This increased tonnage therefore means increased strength and greater steaming power, and it therefore follows that every year a large proportion of our mercantile marine has become more and more capable of taking care of itself and of evading hostile depredation. So much is it the case that the actual amount of new tonnage added to the English mercantile marine during the past ten years is very nearly equal to the total of the steam tonnage of the rest of the world. While, therefore, the magnitude of the interests we have to protect is one element in the calculation, that which should primarily govern us in considering the strength of naval establishments is the amount of force which is available to attack or

Sir Arthur Hood.

House of Commons Select Committee.

Reasons for considering an increase of strength was necessary.

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Putting more into the Navy than is taken out of it.

more than we took out of it, and so to build it up towards the level at which we thought it ought to be maintained. Her Majesty's Government had to consider whether this should be the principle on which the new programme should be based. There was an alternative on which to base our programme, and that was, after a full survey had been made of the requirements of the Navy and of the country, and having ascertained what the deficiencies were, to do our best to make them good with all the rapidity which was consistent with good construction. Her Majesty's Government determined to adopt that principle and our new shipbuilding programme is based upon it. Undoubtedly it is an advance—at least I think I may say it is a departure from the principle on which or the methods by which preceding shipbuilding programmes have been distinguished.

Basis of the new programme.

Doctrine that expenditure should be regulated by the experts.

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The Queen's Speech.

injure our commercial interests. In Her Majesty's gracious Speech allusion is made to the fact that there has been in recent years increased expenditure on naval armaments by European nations. It is quite true that this is not altogether applicable to the last two or three years with regard to the leading naval Powers of Europe, but taking the last fifteen years, and dividing them into quinquennial periods, it is found that each five years show an increase on the previous five years. This is true of every European nation that has any considerable seaboard. It must always be remembered that naval expenditure differs in this respect from military expenditure —that the actual returns are not available so soon. If any one wants to examine into a naval budget, he must not merely have regard to the expenditure in any one year, he must go behind this to the expenditure of some of the years before; and this will not infrequently disclose the fact that in a year when the expenditure has apparently fallen there has been the greatest increase of naval force, owing to ships the expense of which has been met in the expenditure of previous years being completed in this year. In this respect we have had a great advantage during the last few years. We have adjusted the work we have taken in hand with our finances, and we have been able to make most rapid progress with all the vessels we have had in hand. Foreign nations, however, have acted on another principle. They have allowed their shipbuilding programme to outrun the finances of the year, and we must bear this in mind when comparing the expenditure of foreign nations with our own. If we apply this test, we find that during the next five years, there will be a large addition to the war fleets of Europe, especially in the matter of battle-ships. I had hoped some two years ago that the Nile and Trafalgar would be the last battle-ships laid down in this country. It then appeared as if there was to be a general cessation of armour-clad building owing to the appearance of the torpedo-boats. But the powers of these torpedo-boats had been greatly exaggerated by naval officers. France suspended her armour-clad building, and other nations followed her example; but since then, owing in part to the invention of quick-firing guns, there has been a return to the building of battle-ships, and during the present year and the next three or four years there will be more money spent on the building of battle-ships than in any previous year. Our supremacy on the sea must, after all, be measured by the number of battle-ships we can put into line. (Hear, hear.) It is therefore our duty, as we find other nations pushing forward this particular class of ship, to do the same. (Hear, hear.) In the observations I have made I am re-echoing the view

Foreign nations generally have increased their naval expenditure.

The action of foreign nations.

First Lord had hoped Nile and Trafalgar would have been our last battle-ships.

How supremacy on the sea must be measured.

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expressed in the gracious Speech that our relations are friendly and cordial with all nations. (Hear, hear.) Still it requires no very deep student of history to know that there are certain sections of opinion and of influence which are unfriendly to this country, owing to jealousy of our prosperity and envy of our great colonial expansion, and, if in any case these influences happen to become temporarily predominant, we cannot ignore the fact that the increase of the naval forces opposed to us would be a very serious matter. (Hear, hear.) I have endeavoured during the past year to study the speeches of those who in previous years have held my position and that of Prime Minister, so as to ascertain what was the paramount idea underlying their utterances when they spoke of the standard of strength on which our naval establishment should be maintained. I think I am correct in saying that that idea has been that our establishment should be on such a scale that it should at least be equal to the naval strength of any two other countries. (Hear, hear.) I notice that the right hon. gentleman the member for South Edinburgh (Mr. Childers) has given expression to that view, and has stated that he felt certain that when he left the Admiralty the British fleet was equal to the combined naval forces of any two other countries. That may be the case; but it must be borne in mind that at the time of which the right hon. gentleman speaks there was only one considerable naval Power in Europe, while the feature of the present situation is that there are now not one or two, but four or five nations which are spending largely on their naval armaments. With this tendency to development going on, it is quite clear that the strength of the combination of any two other countries must be regarded as considerably increased in the aggregate. (Hear, hear.) This is a fact that we cannot ignore, and we must therefore either be content with a less measure of precaution than in the past, or we must be prepared to face an increased expenditure. (Hear, hear.) With regard to the effect on our commerce of a naval war, I do not refer to the possibility of our commerce being annihilated or our food supplies cut off, but I desire to point out that, in order to prevent a great shock and disturbance to our trade and its consequent dislocation, due to apprehension of what might occur, it would be most necessary that there should at the outbreak of a war be a feeling of perfect confidence in our naval strength. (Hear, hear.) The recent manœuvres have given us some useful lessons. Whoever is in command of a campaign requires information on two points. He wishes to know the amount of the force that can be brought against him, and he also wishes to know the uses to which it can be put. On land the number of

Foreign jealousy.

Standard of our naval strength.

Mr. Childers.

Effect of a naval war on our commerce.

The lessons of the recent manœuvres.

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military movements or combinations is limited by many conditions—the geographical line of the country, the course of the rivers, and other limitations of this kind—but it is not so in regard to naval warfare. A ship is self-supporting and independent of such limitations. No amount of foresight or calculation can anticipate naval combinations and naval movements. (Hear, hear.) For the purpose of meeting such unexpected blows we should have a considerable margin of reserve. (Hear, hear.) I venture to lay these arguments before the Committee, because I think they are worthy of attention, and are incontrovertible conclusions for the premises with which I started. I am no alarmist, and in the controversies that have taken place during the last few years I have frequently combated exaggerated and sensational statements, for I have always considered it unwise to take advantage of ephemeral excitement to call for unnecessary expenditure. (Hear, hear.) Nothing is more foolish than to enforce demands for increased expenditure by arguments based on facts which will not bear strict inquiry. But there seem to me to be no alternatives but those I have stated; we must either be content with a lower standard of precaution than in the past, or we must be prepared to face increased expenditure. (Hear, hear.) Her Majesty's Government, in the present state of European politics, cannot recommend the former course; on the contrary, we shall use all our influence and authority to endeavour to induce the House of Commons to meet this necessity for increased naval expenditure. (Hear, hear.)

Margin of reserve.

Having stated, therefore, the nature and scope of the scheme which I am about to propose, I should like to turn to some other conditions to which, in the opinion of Her Majesty's Government, that scheme should conform. We considered that it should be entire in itself, and adequate not only to our immediate but also to our future wants. We considered that every vessel should be an effective war vessel of the newest type and most approved design, and that every vessel when once laid down should be pushed on with all the rapidity compatible with sound construction, and that as these vessels approach completion preparations should be made for the necessary accumulation of men and stores and guns which would enable a ship to become an efficient fighting machine. (Hear, hear.) To associate with that scheme of expenditure these business-like conditions necessitated a good deal of previous investigation and work. Upon that work we have been engaged for the past two years, and, although there may seem at first sight to be little connexion between the proposals I now have to make and the work we have done in reality, that work is the foundation on which we base our scheme. We con-

Conditions to which the scheme of naval construction should conform.

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sidered it to be essential that before we asked the House for additional money for naval purposes we should be able to show that the national shipbuilding yards were well administered, that the scandal of ships waiting for guns should not be repeated, and that the designs for new ships should be in accordance with the view of naval officers and naval scientists. Upon the questions of the administration of the dockyards, the supply of guns, and the preparations of designs, I will therefore say a few words. In the comparison too frequently made between our dockyards and private yards sufficient allowance is not made for the variety and multiplicity of those duties which the former have to perform, and from which private yards are free. (Hear, hear.) Everything that relates to a great fleet of warships has to be done in the dockyards. All the officering, manning, victualling, storing, coaling, and lighting—these and many other services, which in a great commercial port are performed by various public and private agencies, are performed in the dockyards. In addition to this, it is necessary to have a great accumulation of stores and men ready for action at a moment's notice. Moreover, we have so to arrange our machinery that every branch of it may be capable of great expansion in case of emergency. Naval mobilization is just the reverse of military mobilization. The former is decentralization and localization, while the latter is concentration and centralization. If we were unfortunate enough to get into any war, every man, every officer, every store, and every gun, as well as ammunition, would have to pass through the dockyards in order to be put on board the ships commissioned in those dockyards. Therefore, though it is necessary to keep a tight hand on these auxiliary and incidental services, it would be most unadvisable to cut them down beyond a certain limit, because in case of emergency it would be impossible to expand or extend them. In the past three years we have eliminated these incidental services from shipbuilding and repairing. We have brought them to account and have largely reduced their amount. We have made regulations by which men once put on shipbuilding are kept there and not taken for other purposes, and we have established a form of account which is working admirably. These alterations have effected a perfect revolution in the dockyards. Ships are now built with a rapidity rivalling that of private yards. The Trafalgar, which is the largest ship of war ever built in this country, was completed in the unprecedentedly short time of three years and three months. It is conclusively proved in this instance that rapidity of construction is a convertible term for economy of construction (hear, hear), for not only has the ship been built with this great expedition,

Dockyards and private yards compared.

Difference between naval and military mobilization.

Ships built more rapidly.

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but the saving on the original estimate is £100,000, of which £87,000 is on labour alone. (Cheers.) The last ironclad built is the Anson, which is of much less tonnage than the Trafalgar. Six years were occupied in her construction, and the cost of labour alone on that lesser ship was £30,000 more than on the Trafalgar. Therefore a cardinal point of our new proposals is that we should establish in our dockyards a system by which there should be a statutory enactment that ships should be pushed on with all possible rapidity (hear, hear), for it is better for this House to limit the number of ships than to assent to a larger number and then to reduce and curtail the money necessary for their completion. And now I turn to the question of guns. The knowledge that a considerable number of very powerful ships had so long been waiting for their guns has resulted in somewhat exaggerated statements being made as to the conditions and power of our ordnance. In the earlier days of heavy ordnance English guns were muzzle-loaders, and the muzzle-loading system was brought to great perfection, so much so that naval officers declined to part with their guns, which were in every way equal to the breechloaders of foreign nations. About twelve or thirteen years ago a new kind of powder was discovered, known as the cocoa or slow-burning powder, from which much better results were obtained than from the old powder. Nevertheless expert opinion clung to the muzzle-loaders and declined to sanction the introduction of a breech-loading system. Experiments went on, till at last it became clear that we should be hopelessly left behind by foreign nations unless we adopted breechloaders, because the length of the gun necessary to utilize the slow-burning powder prevented facility of muzzle-loading. We then took to breechloaders in 1880, and we have had in the last seven years to concentrate an amount of labour which in other nations has been spread over three times that period. In dealing with questions of so experimental a character as those relating to the manufacture of big ordnance there must be a certain number of failures and mistakes. Our failures and mistakes were not greater nor more numerous than those of other nations, but they have been compressed within a much shorter period of time. Subsequently a system of lining was introduced in the construction of a considerable number of guns. That answered very well for a certain time, and then there was a failure, and the whole of those guns had to be remanufactured. My right hon. friend the Secretary for War and I had to inquire during the past year in order to ascertain how this block could be removed, and, if it were removed, whether the resources and producing power of this country are so large as to

Anson—Trafalgar.

The story of the guns.

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enable us to say with confidence no great number of ships would be detained for want of guns. In answer to my hon. friend the member for Preston I showed that by the end of the financial year 1888–90 all our ships requiring heavy ordnance would be supplied with their guns. The vessels of this year will be supplied with their guns, though there will be a delay of two months. After that the block will be entirely removed. I speak as to the user, while my right hon. friend speaks as to the manufacture, and we are both quite confident that for the future no block of the same character will occur, and that if orders are given in time, and if no change takes place in the designs (Opposition cheers) during construction, the sources of production will hereafter be quite equal to our naval wants. (Cheers.) I will undertake that the orders are given in time, and my right hon. friend will undertake that there is no change in the designs after the guns have once been ordered.

Designs of ships.

Now I wish to say a word on the subject of designs. We have a large number of ships which are coming on, and we wish to impose a test more effective than that of the measured mile and the ordinary experimental cruise, because we have formed certain opinions regarding their merits and defects and are conscious that they should be thoroughly tested. We have had the advantage of the naval manœuvres, and that has fully confirmed the opinion we have formed, and all the vessels which we propose to build will be characterized by a high freeboard, more length, more engine room, and we shall avoid cramping too much. (Hear, hear.) We have designed a new ship of war which shall not only be capable of fighting, but shall also give decent accommodation for the officers and men on board and in all weathers. (Hear, hear.) So far as the question of design, construction, or armament is concerned, we can give every assurance that any increase of expenditure which may be sanctioned shall be given effect to in a prompt and business-like manner. (Hear, hear.)

New programme.

I now turn to the exact number of ships which we propose to build, and the expenditure associated with them; but I do not propose to give the individual cost of each vessel, following the precedent set by Lord Northbrook in 1885, because, if we are to derive the benefit of contractors, it is not advisable to give them too close a line as to their tenders. (Laughter.) The number of ships which we consider should be added to Her Majesty's Navy in our new shipbuilding programme is 70 (Ministerial cheers), and their estimated cost, including armament, is £21,500,000. (Ministerial cheers and counter-cheers.) We propose to build eight first-class battle-ships, with a displacement of 14,000 tons; two second-class battle-ships,

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with a displacement of 9000 tons; nine first-class cruisers, with a displacement of 7300 tons; 29 smaller cruisers, of the Medea class, with a displacement of 3400 tons; four smaller cruisers, of the Pandora class, with a displacement of 2600 tons; 18 torpedo gunboats, of the Sharpshooter type, with a displacement of 735 tons—making a total aggregate tonnage of 318,000 tons. As to the time each of these vessels will take to complete, the first-class battle-ships will be finished in from three-and-a-half to four years; the second-class battle-ships, in three years; the first-class cruisers, in two-and-a-half years; the smaller cruisers, in two years or somewhat less; and the gun vessels in one-and-a-half year. Of the aggregate cost of £21,500,000 for these 70 vessels, the sum of £16,150,000 will be for engines and hulls, and £5,350,000 for the armament. Dividing the sum of £21,500,000 into two portions, one of £11,500,000 and another of £10,000,000, the sum of £10,000,000 represents the work which we propose to put out to contract, and the £11,500,000 is the amount of work which we propose to assign to the dockyards. The first sum of £10,000,000 will enable us to build, arm, and equip the following vessels:—4 battle-ships, 5 first-class cruisers, 17 second-class cruisers, and 6 torpedo gunboats—making a total of 32 vessels; and I propose to put the whole of these 32 contracts out in the course of the present financial year. (Ministerial cheers.) Funds for this expenditure will be raised by methods and under conditions which the Chancellor of the Exchequer will subsequently explain. If I find there is any tendency to run up prices against the Admiralty we may have to alter our decision on that point, but with that one reservation we intend to put this amount of work out. For the purpose of building and completing the remaining 38 vessels and their armament there is £11,500,000. This sum, which is to be included in the ordinary estimates, can be divided into two heads—£8,650,000 for construction of engines and hulls, and £2,850,000 for armament. We propose to lay down in the dockyards this year 20 vessels, as follows:—4 battle-ships of the first class, 1 of the second class, 3 first-class cruisers, 6 second-class cruisers, and 6 torpedo gunboats. Adding these 20 to the 32 put out to contract we have 52, leaving 18 out of the 70 still to be accounted for. A second-class battle-ship will be laid down early in the financial year 1891, and the other vessels will take their places on the slips in the dockyards as soon as they become vacant by the launch of the vessels laid down in the first year. The whole of the programme, including both dockyard and contract work, is to be finished in four-and-a-half years from the date of the commencement of the first vessel.

Time to complete the ships.

Cost.

Expenditure in dockyards and by contract.

How money is to be raised.

Dockyard work.

Contract work.

Entire time to be occupied in building.

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(Cheers.) There is a naval and an administrative advantage in this distribution of work to which I should like to call attention. Taking the programme as a whole it consists of 70 ships, 10 of which are battle-ships and 60 cruisers of different types. A battle-ship takes very much longer to build than a cruiser—three-and-a-half or four years—and if they are to be finished within four-and-a-half years they must all be commenced in the first year. But a battle-ship when completed is not efficient unless she has certain small vessels attached to her as scouts (hear, hear), and we consider that out of the 70 vessels 20 are the satellites of the battle-ships. The remaining 40 cruisers will be effective whether used in squadrons or individually. We propose to commence the construction of the whole of these this year, and thus make an immediate addition to the Navy of what it most requires. Later on, when an increase is made to our battle-ships, each battle-ship will be accompanied by two smaller vessels, and thus there will be no drain upon our force of independent cruisers. This enables us to carry out effectively the whole of our shipbuilding programme, and it also enables us to give continuous employment in the dockyards, thus avoiding the great evils of a sudden expansion of business. (Cheers.) In order to absorb the amount represented by this sum of £11,500,000 we raise the shipbuilding vote in the ordinary estimates by £615,000, and reduce the ordnance vote by £400,000, because we intend to purchase all the ordnance for the contract ships out of the £10,000,000 to which I have referred. If the shipbuilding vote be kept at the level at which we propose to put it, and the ordnance vote at the same level, there will be sufficient to provide for the whole of this work as well as for all the work we have in hand, and to complete in the period of four-and-a-half years. (Hear, hear.) The Committee will observe the extreme rapidity with which we propose to build these ships. In France a battle-ship takes nearly ten years to complete. In this country, previous to 1885, ironclads took six years and large cruisers four years. We propose to lay down 70 vessels, including 10 battle-ships, in four-and-a-half years. It is in the interests of economy that we make this proposal.

Time occupied in building each class of vessel.

Order of building.

Financial arrangements.

"Lord R. Churchill: Are the 70 vessels to be the total shipbuilding production of four years, or in addition to the ordinary programme?

"Lord G. Hamilton: No; perhaps I may explain. When Lord Northbrook made his proposals there were a large number of ships in the dockyards which were in process of building, and what he did was to increase the existing shipbuilding programme by making

Lord Northbrook's arrangements.

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certain additions to it. I stated that on April 1, 1890, there would only be four ships in Her Majesty's dockyards and under contract, independent of this programme, which would not be complete. These four ships would be in the last stage of construction. After this year, therefore, the whole of the Naval Estimates are available to carry out this part of the programme. The rapidity of construction means economy, because delay occasions twofold waste—not only does the ship cost more in construction, but the longer it is on the stocks the less is its life as an effective ship, and, therefore, the less use you get out of it. In order to ensure rapidity of construction for the whole of these ships, contract as well as dockyard ships, we propose to put them in an Act of Parliament in two schedules, enacting that they shall be completed within the period I have mentioned—namely, by April, 1894. A special account will be kept of each of these vessels, and those accounts will be subject to the ordinary control of the Treasury and the Auditors-General. In order that the dockyards may not be subject to certain impediments which prevent the ships from being completed as rapidly as possible, we propose slightly to adjust the financial machinery in two essentials as regards excesses and balances of votes. There is perhaps no practice, however laudable in its pretensions, which results more in extravagance than the practice of surrendering balances because the contractors have failed to deliver within a certain period. The liability remains, but the money goes back into the Exchequer and goes to the reduction of the National Debt. It is practically a misappropriation of funds. The taxpayer is taxed one year for certain work, but because the contractor, through some unforeseen circumstances, is unable to deliver the work a day in advance of March 31, the money so raised goes back into the Exchequer, and next year the taxpayer is taxed again for the same purpose. That is not only unfair, but most prejudicial to economy. The unquestioned tendency in the departments is to surrender as little as possible, and there are a number of devices by which attempts are made to reduce expenditure which would come into the next year by anticipating it, in order that in a subsequent year this deferred liability may be met without upsetting the departmental finance or the estimates of the Chancellor of the Exchequer. Therefore, the proposal we make is that balances in reference to shipbuilding should be retained. But we go further. There are certain articles and certain stores, such as armour plates and steel castings, which only a limited number of firms produce, and we must take these goods when we can get them. It is very likely that in dealing with transactions of this magnitude armour

Advantages of building ships rapidly.

Special accounts to be kept.

View as to the usual financial arrangements.

The new proposal.

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plates may be delivered sooner than anticipated, and heavy payments have to be made which would disorganize arrangements, and, therefore, provision is made for a temporary advance for the purpose of meeting any such payments, the advance being immediately repaid as soon as there was a surplus at the credit of the department. We propose to allocate to new construction in the coming financial year, 1889–90, £2,645,000, but only £1,360,000 is available for the new programme, the remainder goes to the completion of those ships still in hand. Next year, 1890–91, we propose to allocate £2,590,000 for new shipbuilding, and of that £2,340,000 will go to the new programme. In 1891–92 we propose to allocate £2,560,000 to new construction, and the whole of that will go towards the new programme. Next year we estimate that only £1,650,000 will be required, and in 1893–94, £740,003. These sums in the aggregate amount to £8,650,000. We propose in the same way to distribute the money necessary to arm these ships and to make provision for it out of the ordinary ordnance vote. Adding that sum of £8,650,000 to the amount required for ordnance, which is £2,850,000, we get £11,500,000, which is the whole of the work we propose to put upon the estimates. Therefore, summing up our scheme, it comprises the building of 70 vessels, it involves the expenditure of £10,000,000 out of the special fund, the nature of which my right hon. friend will explain; and it involves an increase of £615,000 in the shipbuilding vote, but there will be a reduction of £400,000 in the ordnance vote, making a total increase of £215,000. I do not wish to anticipate the discussion on the ordinary estimates, but there is certain work which we propose to take in hand, and which forms so essential a part of our shipbuilding policy that I must allude to it. There are a considerable number of our ironclads whose boilers are much worn. We propose to take all these vessels in hand and spread their repairs over a number of years, on this principle—that as few vessels as possible should be laid up at one time. (Cheers.) Certain of these vessels are worth re-engining, others are worth re-arming, so that in certain cases these vessels, re-boilered, re-engined, and re-armed, will be more efficient and powerful than on the day they were first commissioned. The vessels we propose to take in hand are the Minotaur, Achilles, Superb, Thunderer, Devastation, and Rupert—they will all be taken in hand this year. Next year we shall deal with the Hercules, Monarch, Sultan, and Invincible. We propose also to thoroughly refit the Nelson, Audacious, and Triumph this year—that is included in the ordinary shipbuilding vote, which has been increased by £615,000. By taking these vessels in hand and repairing them, we are enabled

Proportion of expense for the new programme.

Summary of the scheme.

New boilers for existing ironclads.

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to do that which many sailors have long advocated. We shall be able to substitute in the next eight months four efficient and sea-going ironclads for the four hulks which now carry the flags of the Commanders-in-Chief at Sheerness, Portsmouth, Plymouth, and Kingstown. These vessels will have all their stores and all their coal on board, and they will be prepared at a moment's notice to go anywhere. This means a great addition to our reserves in the home waters. (Hear, hear.) The only other increase in the ordinary estimates worthy of note is in regard to the provision we make for improving the coaling facilities for our fleet in the Channel. We also propose to dredge the Medway, so as to allow first-class ironclads with all their weights on board to pass down with the ordinary tide. We also propose to increase the votes 1 and 2 by the sum of £250,000 for the purpose of adding 3000 men besides those voted last year. (Hear, hear.) Those 3000 men would comprise 1100 marines, 1000 stokers, and about 900 bluejackets. These sums will show a total increase of £602,000 over the Naval Estimates of the preceding year. The Committee will naturally ask, Does this increase on shipbuilding carry with it great progressive increases in future, so far as the expenditure on stores and men is concerned?—because I think it would be very unfair to get the Committee by a side wind to assent to an increase of one branch of expenditure without placing clearly before hon. members the increase which that sanction entails in other branches of expenditure. On that point I can give satisfactory assurances to the Committee. We at present have sufficient men to man every available vessel, but when all these ships are completed we shall want a considerable additional number. While I think it most desirable to accumulate a large reserve of war vessels for an emergency, I do not think it would be reasonable to ask the Committee to vote all the money necessary to maintain sufficient men on the continuous service system to man all those vessels. A certain increase will be necessary, but that increase, spread over the next five years, will, I think, not amount to more than £250,000 in the aggregate. I propose, in conjunction with the President of the Board of Trade, to turn attention to the development of the Naval Reserve. In the Naval Reserve you have most admirable material, and, as our deficiencies are mainly under the heads of lieutenants and stokers, I have no doubt we shall be able to make some arrangements by which a very large proportion of those deficiencies can be supplied without a great addition to the Estimates. On the other hand, there will be a substantial contribution next year from Australia as an appropriation in aid; there would be, as the

Improved coaling facilities.

Additional men for the fleet.

Naval Reserve.

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Committee would recollect, a decrease in the shipbuilding vote two or three years hence if the House was satisfied with the strength at which the Navy was maintained; and there would also be two or three years hence a considerable decrease in the ordnance votes. I am looking closely into the question of the reserves of ammunition. The proportion of reserves was fixed many years ago, when production was limited and slow. Now that production has rapidly increased, I do not think it advisable to keep large stores of perishable material. I hope I shall be able to make emergency contracts with the great firms who manufacture these articles, and, if so, we shall be able to accomplish a substantial reduction in our ordnance vote. Therefore, putting together all these decreases, and putting against them the only prospective increase, I think I may say our scheme carries with it, as it progresses, a reduction rather than an increase of expenditure. ("Hear, hear," and a laugh.) I must next say a word or two upon that part of our work, on which we have bestowed most trouble and anxiety—namely, the preparation of designs of the respective types. Now, in preparing those designs we were all very much impressed with the great difference between the requirements of the British Navy and those of foreign navies. The great mass of European navies are kept in peace time within inland seas, such as the Baltic, the Black Sea, and the Mediterranean; with the exception of France they have outside Europe few bases of operation. Now, vessels intended for short cruises require neither the sea-going qualities nor the coaling capacity which English ships must have. Therefore, if these qualities are to be obtained, our ships must be larger and larger; and, if they are to be equal in armament and superior in speed, the coal-carrying capacity must necessarily be larger. The Committee will have noted the large dimensions of many of the ships we propose to build. We have ascertained that increase of size does not carry with it corresponding increase of expenditure, but it does carry with it a proportionate increase in the length of life of the vessel as an efficient fighting machine. We have therefore prepared our designs on that principle, and I would just roughly state what they are. The torpedo gunboat will be a vessel of 735 tons, with a raised deck forward, a speed of 21 knots, as against a tonnage of 550 and a speed of 18 knots of its predecessor, the Rattlesnake. The Pandoras are an exact reproduction of the vessels building for the Australian colonies, which have given satisfaction to all who have examined their design. The improved Medeas are an improvement on the original Medeas. Their speed is the same, 20 knots, their armament is somewhat heavier, but they are 35 feet longer and have

Ammunition reserve.

New designs.

Torpedo gun-boat.

Pandora class.

Improved Medeas.

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First-class cruisers.

600 tons greater displacement. The first-class cruisers are vessels of 7350 tons, as against 4050 tons of the original Mersey, on which they are supposed to be an improvement. Their speed is 3 knots greater—namely, 20 knots. Every one of the above types represents a design which has either given satisfaction or is an improvement upon a well-known and satisfactory ship. I propose to-morrow to lay on the table a paper giving full particulars of our whole procedure. In the meantime this paper I will roughly summarize. The Select Committee on the Navy Estimates last year suggested that as regards the distribution of armament of battle-ships outside opinion should be called in. I very soon found out that the outside opinion wanted was not that of designers, but of naval officers. I am fortunate enough to have at the Admiralty four officers, three of whom have held the post of Director of Naval Ordnance, and one now ably discharges the duties of that office, and in those four gentlemen I believe I have more technical knowledge as to ordnance than can be found in any Admiralty in the world. We discussed the subject at very considerable length what should be the distinctive features and qualities of the new battle-ships, and we had a considerable number of alternative designs prepared, with their weights, showing what could be done, because the difficulty is not what is put in, but what you leave out. These were all worked out. I was anxious to get the best outside naval opinion I could get; and, therefore, I sent the designs to the three Admirals appointed to report on the Naval Manœuvres and to the two Commanders-in-Chief. Afterwards we met at the Admiralty and had a full discussion on the subject, a report of which will be found in a Parliamentary paper; and I am glad to say we were almost unanimous in the decision at which we arrived. Roughly speaking, the disposition of armament is that of the Admiral class, though the number of guns is considerably greater, while the disposition of armour much more resembles that of the Trafalgar or the Nile. They are vessels of great coaling and high steaming capacity, with a speed of 17½ knots. I believe they will give almost universal satisfaction to the service, while as regards seagoing qualities they will be capable of being sent to any part of the world and in any weather. (Hear, hear.) Just before I sit down there is one other subject on which I should like to touch. Our scheme is naturally based on the nature of the work which in an emergency our Navy will have to do. The area to be covered and the duties to be performed are so great and various that I should like roughly to indicate to the Committee the distribution of that work and the means by which we hope to carry it out. Our first duty will be *so*

Select Committee recommended.

Consultation for designs.

Three Admirals examined the designs.

The new battle-ships.

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to dispose of our fleets that our coasts should be defended from invasion and our naval stations from bombardment, and this disposition should be carried out on wide and general lines for the protection of commerce. These duties must be exclusively performed by the regular Navy. The second branch of the subject is the protection of our commerce on certain trade routes. The great bulk of this work also must be done by the Navy, but the armed cruisers of the mercantile marine can be associated with the Navy in the discharge of that duty. (Hear, hear.) I am sorry to see depreciatory observations made as to the inferiority of the merchant cruiser on the ground that it would not be a match for a war vessel of the same size. Of course they are not a match for a war vessel of the same size; if they were, there would be no object in having war cruisers. But they will be more than a match for any cruiser of the same character, and in all those movements of dogging the footsteps of a foreign merchantman, embarrassing a foe, and keeping touch with a squadron that has broken blockade, they will be absolutely invaluable. (Hear, hear.) I advocate the extension of the system on still higher grounds. The discipline of the mercantile marine is every year improving, and I believe it is very much to the advantage alike of the mercantile marine and of the Navy that they should be brought together, and I trust the House will always insist on that being a primary feature of Admiralty policy. Now, I turn to the third question, on which there has been a great deal of agitation, and particularly in the neighbourhood of Newcastle—namely, the question of local defence, and I will only deal with that portion of it which is known as the floating defence. Now, we asked the commercial ports to co-operate with us in the discharge of this duty, and they willingly complied. The primary duty of the Navy, in my judgment, is to prevent attacks upon those ports. Their secondary duty is to co-operate with the land forces. Now the gentlemen we asked to co-operate in that secondary duty attached to that co-operation conditions which would have fettered us in the discharge of our primary duty. They wished us to station certain war vessels at different ports and leave them there in time of war. We could not assent to such an arrangement, because if we made it in time of peace it would not be worth anything in time of war. There is some limit to the amount of money for naval purposes which Parliament can vote (ironical cheers), and the more that money is locked up in vessels stationed at different ports of the coast, the less remains for the general defence of the country and the Empire. If our naval supremacy were seriously impaired no system of local defence, however efficient, would give protection to the country. On the other hand, if our supremacy is

Protection of commerce.

Merchant cruiser.

Local defence.

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First-class cruisers.

600 tons greater displacement. The first-class cruisers are vessels of 7350 tons, as against 4050 tons of the original Mersey, on which they are supposed to be an improvement. Their speed is 3 knots greater—namely, 20 knots. Every one of the above types represents a design which has either given satisfaction or is an improvement upon a well-known and satisfactory ship. I propose to-morrow to lay on the table a paper giving full particulars of our whole procedure. In the meantime this paper I will roughly summarize. The Select Committee on the Navy Estimates last year suggested that as regards the distribution of armament of battle-ships outside opinion should be called in. I very soon found out that the outside opinion wanted was not that of designers, but of naval officers. I am fortunate enough to have at the Admiralty four officers, three of whom have held the post of Director of Naval Ordnance, and one now ably discharges the duties of that office, and in those four gentlemen I believe I have more technical knowledge as to ordnance than can be found in any Admiralty in the world. We discussed the subject at very considerable length what should be the distinctive features and qualities of the new battle-ships, and we had a considerable number of alternative designs prepared, with their weights, showing what could be done, because the difficulty is not what is put in, but what you leave out. These were all worked out. I was anxious to get the best outside naval opinion I could get; and, therefore, I sent the designs to the three Admirals appointed to report on the Naval Manœuvres and to the two Commanders-in-Chief. Afterwards we met at the Admiralty and had a full discussion on the subject, a report of which will be found in a Parliamentary paper; and I am glad to say we were almost unanimous in the decision at which we arrived. Roughly speaking, the disposition of armament is that of the Admiral class, though the number of guns is considerably greater, while the disposition of armour much more resembles that of the Trafalgar or the Nile. They are vessels of great coaling and high steaming capacity, with a speed of 17½ knots. I believe they will give almost universal satisfaction to the service, while as regards seagoing qualities they will be capable of being sent to any part of the world and in any weather. (Hear, hear.) Just before I sit down there is one other subject on which I should like to touch. Our scheme is naturally based on the nature of the work which in an emergency our Navy will have to do. The area to be covered and the duties to be performed are so great and various that I should like roughly to indicate to the Committee the distribution of that work and the means by which we hope to carry it out. Our first duty will be so

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Consultation for designs.

Three Admirals examined the designs.

The new battle-ships.

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Protection of commerce.

Merchant cruiser.

Local defence.

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maintained, no serious attack will be made upon these ports. We were asked to provide material in the shape of ships and guns for those ports which were to be manned by Naval Volunteers. Now, ships and guns cost a great deal of money, and being complicated machines they require a complete training before they can be properly handled, and, in my opinion, it would be a sheer waste of money and power to spend large sums in supplying those ships to be manned by comparatively untrained men. The Volunteer system has worked well so far as the land forces are concerned; it has become a fairly effective reserve at a small cost, but I cannot say quite the same of the Naval Volunteer system. I admire the self-sacrifice and the patriotism which animates the members of that force in going through the tests which the Admiralty imposes. But the great bulk are not seafaring men. They know little or nothing of gunnery; they have also to get their sea legs on and become seamen. It is impossible for any volunteer to sustain the strain and test of such a training. I do not want to have any force which is merely a force upon paper and which has no assigned duties to perform in our system of national and naval defence; and at present our Naval Volunteers are not available for land purposes; they are not under the Secretary of State for War, and from their inability to go through the necessary training they are not available for sea purposes. I have a proposal to make, and I take this opportunity of making it. There is in all these commercial ports a considerable number of small vessels—tugs, passenger steamers, and others—which are quite strong enough to carry a modern gun of considerable size. These are manned by captains and men who know every inch of the coast and the water in the neighbourhood. You have there the very material you want in time of war. I am quite ready to consider a proposition if the ports would co-operate, by which the Admiralty would discuss with them the terms of a capitation grant for men and some assistance towards the hire of vessels which may be passed as efficient, the Admiralty supplying the inspection and instruction, and the guns and material. I believe in this way that we should get in each locality a good nucleus of small vessels—an effective flotilla manned by seafaring men. I make the suggestion because I do not want to shut the door to any self-sacrificing patriotism developed in the Naval Volunteers; but I do want to get some better return for our money than we now get. (Cheers.) I have only one word more to say. The House, I think, will gather from the nature of the details as well as from the principles which I have enunciated that our scheme has been the result of a somewhat slow and laborious investigation. We have been many months at work on this scheme. We

Naval volunteers.

First Lord's suggestion.

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had to embody all the requirements of the Navy. We had then so to adjust them and to spread them over a series of years, that we might not make too great a demand on any particular class of article which is difficult of production and which might arrest our progress and prevent our shipbuilding from proceeding with rapidity. We have turned this scheme over and over again and looked at it from different points of view. We believe that if the House assents to our proposals and the provisions contained in this Bill founded on the resolutions which will be read from the Chair—we believe that we can complete this scheme at the cost we have given and in the given time. There is no branch of the Service or any want of the Service which, we believe, we have overlooked. Therefore our scheme must stand or fall as a whole. A portion of it cannot be cut out without affecting the efficiency of the scheme as an entire scheme. In asking the Committee to give impartial consideration to these proposals, I am afraid I shall appeal in vain to one portion of this House. There is a powerful section of public opinion in the country, ably represented in this House, which objects to all expenditure on the Army and Navy. I so far sympathise with the object of these hon. gentlemen as to assure them that, if ever they can get foreign Governments to adopt their principles, no body of men will rejoice more at their success than the Government for the time being of Her Majesty. (Hear, hear.) But, until they do so succeed, they cannot expect that this country should be the only country to ignore the first instincts of self-preservation. (Cheers.) The late Prime Minister at the beginning of this Session somewhat cavilled at our definition of our scheme of increased expenditure as coming under the head of precaution rather than of warlike preparation. I think the word "precaution" is a just one, and is capable of being sustained. What do we ask this increase of naval force for? It is for the protection of home and domestic interests alone. (Cheers.) Our commerce and our shipbuilding are among the oldest of the hereditary industries of this country. It is through them that many industries have been brought into existence and fostered, and it is by the maintenance of that commerce alone that that huge industrial system of employment which exists in this country can be sustained, and which alone enables thirty-five millions of people to live within these islands. (Cheers.) Then, will this scheme lead to increased expenditure on the part of foreign nations? I think not. We do not attempt in any way to vie with foreign nations in the magnitude of their land forces. Our whole social and constitutional system and policy are utterly opposed to any such competition. But if, on the

The Admiralty scheme must stand or fall as a whole.

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other hand, there should be any foreign nation which should wish to encroach upon us, or to invade our naval supremacy, we have so framed our scheme as to bring into world-wide prominence the incomparable power of this country and its enormous resources. (Cheers.) The scheme which I have laid before the House is one which I do not think all the dockyards of Europe would complete in the time we propose (hear, hear); and, if there are any nations abroad who do wish to compete with us in naval armaments, the mere enunciation of this scheme will show to them the utter futility of their desire. (Hear, hear.) I am aware that in one instance I stand at a great disadvantage compared with my predecessor, Lord Northbrook, when he made similar proposals to Parliament. In that year, 1885, a great constitutional question had been settled, and the leaders of both parties of the State were then in conference in order to give effect to that great change. Now a wide constitutional difference irreconcilably separates on that particular question the two great parties of the State. Still, I have noticed with great satisfaction that right hon. gentlemen opposite, while admitting their differences with us so far as the methods of the internal government of the Empire are concerned, have over and over again asserted that, if any external question should arise affecting either the safety or integrity of the Empire, all these differences would to a large extent be diminished, if they did not vanish altogether. (Hear, hear.) Therefore, while I do not ask right hon. and hon. gentlemen opposite to in any way abandon their legitimate rights of criticism which their administrative knowledge and political position fully entitle them to make on a scheme of this great magnitude, I feel sure I can rely upon their approaching this question of national defence from a broad and patriotic standpoint, and that they will discuss our scheme upon its merits in a fair and impartial manner. It is in that sense I have endeavoured to explain the scheme, and it is in that sense, I trust, the discussion will be continued and the proposals of Her Majesty's Government considered. (Cheers.)"

The Chairman then read the following resolutions :—

The resolution.

"It is expedient that a sum not exceeding £21,500,000 be granted for the purpose of building, arming, equipping, and completing for sea vessels for Her Majesty's Navy; and that it is expedient that a sum not exceeding £10,000,000 be issued out of the Consolidated Fund in seven years ending the 31st of March, 1896; and that a sum not exceeding £11,500,000 be issued out of the moneys to be provided by Parliament for the naval service during the financial years ending the 31st of March, 1894."

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II.

Returns presented to Parliament, giving Details of New Programme of Naval Construction.

Ships which will be added to Her Majesty's Navy, in the period between the 1st of April, 1889, and the 1st of April, 1894.

I.—Ships in Progress.

Class of Ship.	Displacement Tonnage.	Indicated Horse Power.	Name.
Battle Ships, 1st Class*	10,600	11,500	Camperdown.*
	11,940	12,000	Trafalgar.
	11,940	12,000	Nile.
	10,470	14,000	Victoria.
	10,470	14,000	Sans Pareil.
			Five.
1st Class Protected Cruisers*	9,000	20,000	Blake.
	9,000	20,000	Blenheim.
			Two.
2nd Class Protected Cruisers	2,950	9,000	Melpomene.
	2,950	9,000	Magicienne.
	2,950	9,000	Marathon.
			Three.
3rd Class Protected Cruisers	1,830	6,000	Barham.
	1,830	6,000	Bellona.
	1,580	3,000	Barrosa.
	1,580	3,000	Blanche.
	1,580	3,000	Blonde.
	1,580	3,000	Barracouta.
			Six.
Torpedo Depot Ship	6,620	12,000	Vulcan.
Torpedo Gunboats	735	4,500	Sharpshooter.
	735	4,500	Salamander.
	735	4,500	Seagull.
	735	4,500	Spanker.
	735	4,500	Speedwell.
	735	4,500	Sheldrake.
	735	4,500	Skipjack.
			Seven.

* In addition to the ships above-mentioned, the first class battle ships, Howe and Camperdown, and the belted cruisers, Australia, Galatea, Immortalité, Narcissus, and Aurora; also the second class protected cruisers, Medea and Medusa, will be practically complete by the 31st of March, 1889, with the exception of guns not yet delivered.

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other hand, there should be any foreign nation which should wish to encroach upon us, or to invade our naval supremacy, we have so framed our scheme as to bring into world-wide prominence the incomparable power of this country and its enormous resources. (Cheers.) The scheme which I have laid before the House is one which I do not think all the dockyards of Europe would complete in the time we propose (hear, hear); and, if there are any nations abroad who do wish to compete with us in naval armaments, the mere enunciation of this scheme will show to them the utter futility of their desire. (Hear, hear.) I am aware that in one instance I stand at a great disadvantage compared with my predecessor, Lord Northbrook, when he made similar proposals to Parliament. In that year, 1885, a great constitutional question had been settled, and the leaders of both parties of the State were then in conference in order to give effect to that great change. Now a wide constitutional difference irreconcilably separates on that particular question the two great parties of the State. Still, I have noticed with great satisfaction that right hon. gentlemen opposite, while admitting their differences with us so far as the methods of the internal government of the Empire are concerned, have over and over again asserted that, if any external question should arise affecting either the safety or integrity of the Empire, all these differences would to a large extent be diminished, if they did not vanish altogether. (Hear, hear.) Therefore, while I do not ask right hon. and hon. gentlemen opposite to in any way abandon their legitimate rights of criticism which their administrative knowledge and political position fully entitle them to make on a scheme of this great magnitude, I feel sure I can rely upon their approaching this question of national defence from a broad and patriotic standpoint, and that they will discuss our scheme upon its merits in a fair and impartial manner. It is in that sense I have endeavoured to explain the scheme, and it is in that sense, I trust, the discussion will be continued and the proposals of Her Majesty's Government considered. (Cheers.)"

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* In addition to the ships above-mentioned, the first class battle ships, Howe and Camperdown, and the belted cruisers, Australia, Galatea, Immortalité, Narcissus, and Aurora; also the second class protected cruisers, Medea and Medusa, will be practically complete by the 31st of March, 1889, with the exception of guns not yet delivered.

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I.—Ships in Progress—*continued.*

Class of Ship.	Displacement Tonnage.	Indicated Horse Power.	Name.
Sloops	1,170	2,000	Beagle.
	1,170	2,000	Basilisk.
			Two.
Gunboats, 1st Class	805	1,200	Magpie.
	805	1,200	Redbreast.
	805	1,200	Redpole.
	805	1,200	Sparrow.
	805	1,200	Thrush.
	805	1,200	Lapwing.
	805	1,200	Ringdove.
	805	1,200	Widgeon.
	805	1,200	Goldfinch.
			Nine.
Sailing Training Brig	508	..	Mayflower.
Ships for Service in Australian Waters.			
2nd Class Protected Cruisers	2,575	7,500	Pandora.
	2,575	7,500	Pelorus.
	2,575	7,500	Persian.
	2,575	7,500	Phœnix.
	2,575	7,500	Psyche.
			Five.
Torpedo Gunboats	735	4,500	Whiting.
	735	4,500	Wizard.
			Two.
Total number of Ships in progress.	..	..	43

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II.—SHIPS TO BE BUILT UNDER THE NEW PROGRAMME.

Class of Ship.	Displacement Tonnage.	Indicated Horse Power.	Number to be Built.
Battle Ships, 1st Class	14,150	13,000	8
Battle Ships, 2nd Class	9,000	10,000	2
Cruisers, 1st Class, Protected	7,350	12,000	9
Cruisers, 2nd Class, Protected, Improved Medea type	3,400	9,000	29
Cruisers, 2nd Class, Protected, Pandora type	2,575	7,500	4
Torpedo Gunboats, Sharpshooter class	735	4,500	18
Total			70

III.—ABSTRACT of SHIPS, including those proposed in NEW SHIPBUILDING PROGRAMME, which will be added to HER MAJESTY'S NAVY in the period between 1st of April, 1889, and 1st of April, 1894.

Class of Ship.	Number now in Progress.	Number to be Built under the New Programme.	Total Number.
Battle Ships, 1st Class	5	8	13
Battle Ships, 2nd Class	..	2	2
1st Class Protected Cruisers	2	9	11
2nd Class Protected Cruisers	3	29	37
2nd Class Protected Cruisers for Australia	5		
2nd Class Protected Cruisers, Pandora type	..	4	4
3rd Class Protected Cruisers	6	..	6
Torpedo Depot Ship	1	..	1
Torpedo Gunboats	7	18	27
Torpedo Gunboats for Australia	2		
Sloops	2	..	2
1st Class Gunboats	9	..	9
Sailing Training Brig	1	..	1
Total	43	70	113

Next as to the cost. This information is supplied in the return obtained on the motion of Lord Randolph Churchill.

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RETURNS OBTAINED F

RETURN No. 1.

ARRANGED under the following Classes, showing for each Class the NUMBER, the 1st day of January, 1889. 2. STANDARD of STRENGTH of NAVY decided in FIVE YEARS to replace LOSS by DEPRECIATION, &c.; and, assuming that NUMBER, TONNAGE, and ESTIMATED COST of the SHIPS to be BUILT

CLASS.		(a) Effective Ships Afloat, 1st January, 1889.			Proposed Standard in 1894.	
		Number.	Tonnage.*	Cost.	Number.	Tonnage.*
				£		
ARMOURED	Battle Ships, 1st class	17	165,330	10,162,985	30	333,950
	„ 2nd class	15	97,010	4,499,213	17 (c)	115,010
	„ Others	6	55,660	2,496,358	6	55,660
	Coast Defence Ships	12†	37,230	1,596,475	12	37,230
	Cruisers, 1st class.	12	76,650	4,074,225	12	76,650
	„ 2nd class	..	..	..	..	..
	„ Others	..	..	..	..	..
	Total, ARMOURED	62	431,880	22,829,256	77	618,500
PROTECTED	Cruisers, 1st class	..	..	..	11	84,150
	„ 2nd class	10	39,000	1,904,757	51	169,625
	„ 3rd class.	18	36,900	1,975,489	24	46,880
	„ Others	..	..	..	..	..
	Torpedo Depot Ships	..	..	..	1	6,620
	Torpedo Ram	1	2,640	226,305	1	2,640
	Total, PROTECTED	29 (b)	78,540	4,106,551	88	309,915
UNPROTECTED	Cruisers, 2nd class	10	40,470	2,049,644	10	40,470
	Corvettes	1	1,970	86,899	1	1,970
	Sloops.	17	17,870	960,391	19	20,210
	Gun Vessels.	8	6,302	331,200	8	6,302
	Torpedo Cruisers	10	17,320	884,859	10	17,320
	Torpedo Gunboats	4	2,125	151,822	31	21,970
	Gunboats	62	24,326	1,212,413	71	31,571
	Torpedo Boats, 1st class	80	4,178	1,092,093	86	4,538
	„ 2nd class	51	612	189,973	61	732
	Despatch Vessels	2	3,350	167,178	2	3,350
	Torpedo Depot Ship	1	6,400	126,517	1	6,400
	Special Service Ships	14	9,419	402,061	14	9,419
	Miscellaneous	22	34,382	1,044,862	22	34,382
	Total, UNPROTECTED	282	168,724	8,699,912	336	198,634
	TOTAL	373	679,144	35,635,719	501	1,127,049

* Displacement tonnage.

† Exclusive of Cerberus.

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D RANDOLPH CHURCHILL.

RETURN No. 1.

NAGE, and COST of the "EEFECTIVE" SHIPS of the ROYAL NAVY:—1. Afloat on n. 3. Required to bring present Number up to proposed Standard. 4. Required ANCIAL PROVISION for DEFICIENCY be spread over a Period of Years, the ween the 31st day of April, 1889, and the 31st day of March, 1894.

Required to Complete.		Expenditure required to Complete Ships Building.	Expenditure on Ships to be Built.	(g) Annual Depreciation as shown in the Estimates, 1889-90.	Difference between Expenditure as Proposed, and Depreciation as Estimated.	REMARKS.
ber.	Cost.					
	£	£	£	£	£	
13				2,472,625		(a) Effective ships are understood to comprise all ships afloat, except those now under construction, and those which will probably be removed from the List of the Navy as obsolete, and not worth repair, during the period between the 1st April, 1889, and the 1st April, 1894.
2				882,965		
				516,175		
				184,550		
				814,845		
				..		
				..		
5				4,871,160		
						(b) Includes twenty-two partially protected ships.
1				..		
1				..		(c) The Sultan is retained in this number; as it will not be known, definitely, until result of examination is received, as to whether there is a probability of raising the vessel.
6				380,950		
				395,100		
1				..		
				..		
				45,260		
39	(d) 22,669,000	1,546,000	(e) 16,150,000	821,310	11,539,810	(d) The cost of the seven vessels for the Australasian Squadron, building under the Imperial Defence Act, 1888, is not included in this amount.
				755,235		
				94,455		(e) It is unadvisable to give the detailed cost of these ships, as many of them will be contracted for.
2				530,040		
				171,930		
				265,460		
6				60,050		(f) This sum is added as being the amount available under the financial proposals of the Admiralty for the commencement of further new vessels in 1892-94, as those in the Programme 1889-90 approach completion.
0				412,870		
0				484,930		
				118,170		
				61,425		
				37,955		
				102,765		
				422,435		
4				3,517,720		(g) The figures in this column represent the estimated depreciation on the vessels for a period of FIVE years, calculated on their value, as shown in Statement, page 270 of the Navy Estimates, 1889-90, after abating the proportion of incidental charges.
128	22,669,000	1,546,000	16,150,000	9,210,190		
			1,546,000	..		
d.—Money provided and available for new ships to be commenced in the years 1892-94			(f) 3,054,000	..		NOTE.—All figures relating to expenditure are exclusive of the cost of armament, and the proportion of incidental and establishment charges.
GRAND TOTAL . £			20,750,000	9,210,190	11,539,810	

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RETURN No. 4.

STATEMENT of the NAVAL EXPENDITURE on SHIPBUILDING and REPAIRS, &c., in the Four Years ending on the 31st day of March, 1879, and the Four Years ending on the 31st day of March, 1889, compared with the proposed EXPENDITURE for the Four Years ending 31st day of March, 1893.

NATURE OF EXPENDITURE. (a)	1876.	1877.	1878. (c)	1879.	For Four Years. Total.	For Four Years. Average.	1886. (c)	1887.	1888.	1889. (Estimated.)	For Four Years. Total.	For Four Years. Average.
	£	£	£	£	£	£	£	£	£	£	£	£
New Construction (b) . . .	1,613,218	2,121,960	2,922,442	1,508,049	8,165,669	2,041,417	3,737,461	3,495,225	2,819,537	2,686,150	12,738,373	3,184,593
Repairs, &c. (c)	996,825	847,471	1,085,646	1,080,296	4,010,238	1,002,560	988,641	916,286	808,280	974,353	3,687,560	921,890
Armaments (d) { Army Votes .	267,385	371,865	335,248	623,000	1,597,498	399,374	1,524,544	1,490,784	1,253,000	..	4,268,328	1,067,082
Armaments (d) { Navy Votes .	..	..	80,000	18,000	98,000	24,500	..	56,729	81,974	1,863,500	2,002,203	500,550
TOTAL of Shipbuilding Expenditure, &c., from Naval and Army Funds } £	2,877,428	3,341,296	4,423,336	3,229,345	13,871,405	3,467,851	6,250,646	5,959,024	4,962,791	5,524,003	22,696,464	5,674,115

(a) The expenditure shown against "New Construction" and "Repairs," &c., is exclusive of Incidental Charges.

(b) Includes cost of vessels purchased.

(c) The figures appearing against "Repairs, &c.," are inclusive of the value of "Sea Stores for Maintenance," the estimated amounts for which in 1888–89 and 1889–90 are £370,000 and £294,550 respectively. Under repairs is included, in 1890 and subsequent years, provision for reconstructing and re-engining certain ironclads.

(d) In 1885–86 a sum of £567,000 was appropriated out of the Army portion of Vote of Credit for Naval Armaments, and in 1886–87 the sum of £185,000 was similarly appropriated out of a Supplementary Vote. The expenditure shown above for these years is inclusive of the two appropriations mentioned. For the years 1886, 1887, and 1888, the actual expenditure has been furnished by the War Department. For all the other years the estimated expenditure only is given.

(e) In these years a Vote of Credit was granted.

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RETURN No. 4—*continued.*

NATURE OF EXPENDITURE.	1890.	1891.	1892.	1893.	For Four Years.		1894.	For Five Years.	
					Total.	Average.		Total.	Average.
	£	£	£ (*f*)	£ (*f*)	£	£	£ (*f*)	£	£ (*f*)
New Construction	4,650,000	6,196,000	3,960,000	2,050,000	16,856,000	4,214,000	840,000	17,696,000	3,539,200
Repairs, &c.	1,130,300	1,130,300	1,130,300	1,130,300	4,521,200	1,130,300	1,130,300	5,651,500	1,130,300
Armaments . . Army Votes . .	..	..	..	..	..	..	..	..	..
Armaments . . Navy Votes . .	2,308,500	2,278,500	1,963,500	1,803,500	8,354,000	2,088,500	1,463,500	9,817,500	1,963,500
TOTAL of Shipbuilding Expenditure, &c., from Naval and Army Funds . . . . . £	8,088,800	9,604,800	7,053,800	4,983,800	29,731,200	7,432,800	3,433,800	33,165,000	6,633,000
Add—Proposed Expenditure on new ships to be commenced in addition to the new Programme	..	54,000	90,000	1,000,000	1,144,000	286,000	1,910,000	3,054,000	..
£	8,088,800	9,658,800	7,143,800	5,983,800	30,875,200	7,718,800	5,343,800	36,219,000	7,243,800

(*f*) These figures represent only the expenditure on the new Programme. At the foot of table will be seen the money available to commence and advance new ships in the years 1892–94.

NOTE.—The cost of the seven vessels building for service in Australasian waters under the Imperial Defence Act, 1888, is not included in the above amounts.

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III.

PAPER BY MR. W. H. WHITE, DESCRIBING THE DESIGNS OF BATTLE-SHIPS OF THE NEW PROGRAMME OF CONSTRUCTION.

READ AT THE MEETING OF THE INSTITUTION OF NAVAL ARCHITECTS, ON THE 10TH APRIL, 1889.

Mr. W. H. White's paper on the designs for the new battle-ships.

"It has been the practice in this Institution, from its commencement, to devote no inconsiderable part of the proceedings to discussions relating to war-ship construction generally, and to the Royal Navy in particular. Including among its members as it does many most eminent naval officers, as well as the leading shipbuilders and marine engineers in the world, no better opportunity can be secured for the investigation of the scientific and professional questions incidental to war-ship design. On many previous occasions members of the Institution occupying the position which I have now the honour to hold, and gentlemen occupying equally responsible positions in foreign navies, have brought forward descriptions of new types of ships, or problems arising out of their official work, and always with advantage to the public service, as well as to the Institution.

"Recognising the great interest which is now being taken in the designs of the eight first-class battle-ships which are proposed to be added to the Navy, and feeling convinced that no equally suitable opportunity could be obtained for replying to criticisms of the designs which have appeared in the public press, I applied for and obtained permission from the First Lord of the Admiralty to prepare this paper.

Object of the paper.

"Its principal object is to describe the main features of the approved designs for these battle-ships, and to contrast their protection, armament, speed, and coal endurance with the corresponding features in other battle-ships designed during the last twenty years. Incidentally it will be made clear that there are good reasons why these ships surpass in size any previously constructed vessels of the Royal Navy.

"As I proceed with the description, it will be my endeavour to deal as fairly and candidly as possible with the adverse criticisms which have been launched against certain features of the designs, and to show that they are not well founded. In doing this I shall treat chiefly of matters of fact, and as to matters of opinion shall describe the reasons which led to the decisions embodied in the designs. On these matters of opinion we shall probably hear much more in the discussion which will ensue.

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"The 'action taken by the Board of Admiralty with regard to the preparation of designs' for these battle-ships is fully described in Parliamentary Paper C 5635 of 1889 (see Part IV. of *The Naval Annual*, page 556; and a general description of the designs appears in the 'Statement of the First Lord of the Admiralty explanatory of the Navy Estimates 1889–90 (C 5648)' (see also Part IV. of *The Naval Annual*, page 542. I need not reproduce the particulars of the procedure followed; but it may be safely said that no designs prepared at the Admiralty or elsewhere have ever received more thorough and careful consideration by competent authorities.

Choice of designs by the Board of Admiralty.

"The choice eventually made by the Board was made from amongst a considerable number of alternative designs, and in full view of the most recent types constructed, or in course of construction, for the Royal Navy and for foreign navies. Before coming to a decision, the First Lord convened a meeting, attended not merely by the members of the Board, but by a number of most distinguished and experienced naval officers. At this meeting were discussed *seriatim* the several features that should be embodied in the design of a first-class battle-ship—speed, disposition and nature of armament, distribution of armour, protection of heavy guns, freeboard, &c. On each of these points the opinions of the officers present were ascertained. Subsequently the Board issued instructions as to the designs which were to be worked out in detail with a view to building the eight ships contemplated in the programme.

"Two designs have been prepared and approved by the Board. In both designs are embodied identical qualities; so far as relates to the disposition (in plan) of the armament; the number and calibre of the heavy guns; the nature, disposition, and protection of the auxiliary armament; the distribution and thickness of the hull armour; the propelling machinery, speed and coal supply; the complement and equipment; magazines and transport of ammunition; and arrangements for hold-stowage. In principal dimensions and displacement the two types are identical. The essential differences are that while one design is for a turret ship with moderate freeboard at the extremities, and with guns about 17 feet above water, the other is for a barbette ship with the guns carried about 6 feet higher, and with high freeboard at the bow and stern.

"It will be convenient to preface a description of the designs by the consideration of the *disposition of the armament;* a matter of the highest importance, which necessarily exercised great influence upon other features of the design, including (as will be shown hereafter) the distribution of the armour.

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Alternative dispositions of armaments.

"The Board took into consideration all the principal dispositions of armament adopted in recent years for battle-ships, as well as several proposals that have been made—some of which have been patented—but not yet carried out in practice. It may be of interest and assistance in the discussion if I briefly summarize and illustrate some of the more important of these arrangements.

Sultan.

"*Pl.* ***24*** shows the disposition of the armament of the Sultan, designed in 1868. Practically the whole of the armament is contained in a central two-storied battery placed amidships, and associated with a water-line belt of armour. Other illustrations of the 'belt and battery system' need not be given, as it is well known.

Devastation—Thunderer—Fury.

"*Pl.* ***12*** and *Pl.* ***12a*** show respectively the arrangements carried out in the 'breastwork monitors,' Devastation and Thunderer, designed in 1869 and proposed for the Fury in 1870. Here a low freeboard is adopted for the greater part of the length; and the two turrets, each containing two guns, are placed at the ends of the armoured breastwork, which is of less breadth than the ship. This design for the Fury was cancelled, and work upon the ship stopped at an early stage. The vessel was entirely re-designed in 1872 (see Mr. Barnaby's Paper in *Transactions of the Institution of Naval Architects* for 1873), and became the Dreadnought, which is illustrated in *Pl.* ***13***. In all these designs the disposition of the armament is identical: and in securing the 'all round fire' of the turret guns it was made practically impossible to carry any effective secondary armament.

Dreadnought.

Inflexible.

"*Pl.* ***17*** shows the Inflexible; a central citadel ship with turrets placed *en échelon*. In some of the later ships of this type an endeavour has been made to carry a few 6-inch guns as well as light quick-firers on the superstructures; but, as in the previous disposition, the means taken to secure large arcs of command for the heavy guns reduced greatly the efficiency of the secondary armament. *Pl.* ***99*** and ***100*** illustrate the arrangements of the Italian citadel-turret ships Duilio and Dandolo; and *Pl.* ***94*** and ***95*** those of the German citadel-barbette ships of the Sachsen class.

Duilio—Dandolo—Sachsen.

"During the period 1869–78 very little was done in the designs of H.M. ships in the direction of providing for a numerous and effective secondary armament; but this was not true in foreign navies, and particularly in the French Navy.

French barbette ships.

"*Pl.* ***75*** and ***96*** show the principal features in the disposition of armament in a large proportion of the French battle-ships. There are four protected stations, each containing a heavy gun with a large arc of training. At a lower level are placed a number of guns of

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moderate calibre, sheltered to some extent from the fire of the heavy guns. A very similar arrangement has been adopted in the Imperieuse and Warspite of the Royal Navy, where considerable experience has been gained of its practical working.

Imperieuse—Warspite.

"Another typical disposition of the armament is illustrated by *Pl.* ***101*** and ***102***, which represent broadly the arrangements adopted in the Italian battle-ships Italia and Lepanto. Here the four heavy guns are carried *en barbette*, high above water, at the ends of a single armoured enclosure placed near the middle of the length of the ship; nearly the whole upper deck forming a glacis, over which these guns fire if the full arcs of training are obtained. The auxiliary armament is chiefly carried on the main deck, and sheltered by the upper deck from the fire of the heavy guns.

Italia—Lepanto.

"It will be remembered that in the design for an American battle-ship, described by Mr. John in a paper read before the Institution last year, and represented in *Pl.* ***139a***, a somewhat similar disposition of the armoured battery or citadel was adopted, but in association with turrets, and with a different arrangement of the auxiliary armament and upper works.

"*Pl.* ***116*** and ***117*** represent the Russian battle-ships of the Catherine II. class. In this case the battery is of large extent, and at each of the corners pairs of heavy guns are mounted *en barbette*, on the disappearing principle. The upper deck is a glacis for their fire and the auxiliary armament is placed below this deck.

Catherine II.

"*Pl.* ***5***, ***6***, and ***8***, represent the disposition of armament in the Admiral class. Here the secondary armament is greatly developed and mainly carried in a central battery between the two protected stations containing the four heavy guns.

Admiral class.

"*Pl.* ***26*** illustrates the very similar arrangements (in plan) adopted in the Nile and Trafalgar. It will be seen that in these vessels the central battery is shorter, and the secondary armament less numerous, than in the Admirals.

Nile—Trafalgar.

"*Pl.* ***28*** illustrates one of the various arrangements proposed by Sir Edward Reed, under his patent, No. 12,479 of 1887, but not adopted, I believe, in any ship yet built.

Sir Edward Reed's patent.

"*Pl.* ***28a*** illustrates a patented arrangement of Sir N. Barnaby's (No. 7759, of 1888) for securing in ships of relatively small size 'an all-round fire from a single position, the guns being armour-piercing and the armour defending them being as thick as that usually employed for the defence of the emplacements of heavy guns in large battle-ships.' The diagrams given in the patent specifications do not indicate the disposition of the armour in an actual ship, but, as it

Sir N. Barnaby's patent.

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is explained that the funnel is to come up through the centre of the platform carrying the guns, it is obvious that the armoured tower must be placed near the centre of the length of the ship, and that practically the whole of the upper deck must be treated as a glacis over which the guns must fire. So that any auxiliary armament which might be carried would have to be placed below this upper deck. There are other features in the plan in relation to protection, buoyancy, and stability, to which it is unnecessary to make any reference in this connection.

"It will be understood that for the present purpose I am dealing only with these various dispositions of armament *in plan*, and am not discussing the very important question of *heights of guns above water*, to which reference will be made hereafter, as well as to the arrangements of armour plating indicated on the diagrams.

Disposition of armament in new designs.

"After careful consideration of these and other alternative arrangements, the Board laid down the following principles for the new designs :—

"'(1) That there should be four heavy guns placed in two protected stations, situated at a considerable distance apart, each pair of guns having an arc of training of about 260°, equally divided on each side of the line of keel. All four of these guns to be available on each broadside.

"'(2) That the greater portion of the auxiliary (or secondary) armament should be placed in a long central battery, situated between the two heavy gun stations, and so disposed that there should be practically no interference with the fire of any one gun by that of any other.

"'(3) That in view of the development of high explosives, it was desirable to secure the widest possible distribution of the guns in the auxiliary armament; and that it was preferable to mount the auxiliary armament on two decks, one of them being the spar deck, rather than to carry the guns chiefly between decks.'

"The reason for this decision will be found in the Parliamentary Papers above mentioned. It may be well, however, to briefly summarise the most important points of the discussion.

Summary of discussion.

"Under modern conditions, with quick-firing guns and high explosives in rapid development, it is essential to provide every battleship with a numerous, powerful, and well-placed auxiliary armament, in addition to her heavy guns. The disposition of the armament must be such that, while giving great command to the heavy guns, their fire shall not interfere with, or be dangerous to, the lighter guns and their crews. Provision must be made, in fact, for the safe and

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simultaneous working of all the guns, under the excitement of action, when precautions, which may answer fairly well at drill, cannot be certainly enforced.

"Reviewing all the dispositions that have been adopted or proposed, it was seen that the disposition illustrated in the Admiral and Trafalgar classes was superior to all others in the fulfilment of these essential conditions, and it had other advantages.

Distribution of the armament.

"Experience in the Imperieuse had shown that the system of *distributing* the heavy guns in several armoured positions involved a considerable interference with the efficiency and power of independent action of the auxiliary armament. Moreover, the multiplication of protected positions for the heavy guns involves a considerable additional weight of armour for a given thickness as compared with what suffices for the defence of a less number of stations each containing two guns.

Concentration of the armament.

"On the other hand, the principle of *concentration* pushed to an extreme has serious disadvantages and drawbacks, although it enables greater thicknesses of armour to be used within any fixed limit of weight, since it reduces the area to be protected. These objections were considered to outweigh the advantages, and are stated in the Parliamentary Papers as follows:—

"'(1) The great risk of the principal armaments being placed *hors de combat* by the explosion of a single heavy shell within or under the armoured enclosure.

"'(2) The enormous difficulties which this disposition of the main armament introduces into the efficient working of a powerful and numerous auxiliary armament.'

"Experience gained with the vessels of the Admiral class has as yet been limited, but it has confirmed the good opinion formed at the stage of design as to the merits of the disposition of the armament; and, so far as I am informed, the general feeling amongst gunnery officers in the service is that the system is best adapted for modern requirements. We may anticipate that on this point the discussion will afford the Institution an opportunity of hearing the opinions of naval officers.

"I will only add a suggestive fact, mentioned in the Parliamentary Papers:—'In some of the most important foreign navies, where one or other of these modes of disposing the armament had been adopted, and the principles either of extreme distribution or of relative concentration had been carried out, the latest designs had contained arrangements similar to those decided upon as best for future battleships in the Royal Navy, which disposition is also to be found

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represented (in plan) in vessels like the Trafalgar, and in the Admiral class.'

"Referring to *Pl. 26a* and *26b* and *Pl. 8a* and *8b*, and to the tabular statement at the end of this paper, it will be seen that the disposition and character of the armaments in the turret and barbette designs are practically identical. The barbette ship, being of higher freeboard at the extremities, can carry a few more 6-pounders, quick-firers; and her heavy guns are, as before stated, 6 feet higher. But in plan the dispositions are the same, and the secondary armament in the central battery identical.

Number and calibre of heavy guns.

"It has been decided that each ship shall carry four 13½-inch 67-ton guns as the principal armament, with hydraulic apparatus for training, elevating, and loading the guns. The grounds for this decision are stated as follows:—

"'There was a considerable weight of opinion that a 12-inch gun of modern design, and of about 50 tons in weight, might be made, which would possess sufficient power for most purposes; but as no such gun was in existence, and as guns of 75 tons in weight were carried in existing foreign ships, while the 67-ton 13½-in. was thoroughly successful, and all the details of the ammunition and mounting had been settled, it was generally agreed that for the three leading battle-ships, 67-ton guns were to be preferred for the heavy armament.'

"This decision has since been applied to all the ships.

"In the number and power of their heavy guns the new ships will, therefore, stand on the same footing as the Nile and Trafalgar, or the four vessels of the Admiral class—Rodney, Howe, Anson, and Camperdown.

Height of guns above the water.

"The height of the turret guns above water in the Trafalgar as designed was 15 feet; in the new turret ship it will be 17 feet. With the thick armour used for the protection of the turrets and turret bases, this apparently small change in the height of the guns above water involves an additional weight exceeding 150 tons.

"In the barbette ships the heavy guns will be 23 feet above water.

Auxiliary armaments in the new ships.

"While the heavy gun armament is practically identical with that of preceding ships, the auxiliary armament is of unprecedented weight and power. In the Tabular Statement the facts are set out, but I must add some remarks, as there has been serious misunderstanding on this matter.

Sir Edward Reed.

"For example, in a letter published in the *Times* of March 22nd, Sir Edward Reed, in comparing the new designs with the Trafalgar said:—'There is a small increase in the minor armament. . . . The

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increase of minor armaments is too small to dwell upon in this connection.'

"I will endeavour to show how mistaken is the view thus publicly expressed.

"As designed, the Nile and Trafalgar were to carry eight 5-in. guns, besides a considerable number of small quick-firing guns and boat guns. The total weight of this auxiliary armament was a little less than 140 tons. A very short central battery sufficed to contain this armament.

"During construction, six 4·7-in. 45-pounder quick-firing guns have been substituted for the eight 5-in. guns. This reduction in the number of guns has been accompanied, however, by an increase in the total weight to about 185 tons, the Service regulations providing for a very large supply of ammunition for quick-firing guns.

"Turning to the new battle-ships, it will be seen that they are each to carry ten 6-in. 100-pounders, besides a considerable number of smaller quick-firers. The 6-in. quick-firing gun is still in the experimental stage; it will be adopted in these ships if successfully worked out, and weight has been taken for it. So far as *weights* are concerned, these ten 6-in. guns, with their mountings and ammunition, represent no less than twenty *guns of the same calibre*, with the allowance of ammunition hitherto carried.

Weight of the auxiliary armament in the new ships.

"The total weight of the auxiliary armament in the new ships is about 500 tons, or considerably over *three times* the weight originally assigned to the corresponding armament in the Trafalgar, and *two and two-third times as great* as the weight of auxiliary armament to be actually carried by that ship.

"I may fairly claim that such an increase is not properly described as 'small' or 'too small to dwell upon.' On the contrary, to provide for it has proved one of the principal problems in the design. And those familiar with war-ship construction will know well that in stopping short, as I have done, at a comparison of weights of guns, mountings, and ammunition in the two designs, I have greatly understated my case. For example, to accommodate this auxiliary armament a central battery has to be provided about 170 feet in length, whereas in the Trafalgar the central battery is not quite 110 feet in length. The more numerous and powerful 6-inch guns, of course, require considerable additional weights to be worked into magazines, armament fittings, gun supports, &c. And with this increase in armament there has necessarily been associated an increase in complement of over 100 men, as compared with the Trafalgar, together with the weights for provisions, stores, and accommodation corresponding thereto. Were these extra weights,

Large accommodation required for the auxiliary armament.

Increased complement of men.

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which are inevitable when the auxiliary armament is accepted, totalled up, the result would constitute a very large addition to the already large excess which the new ships have to carry.

"To members of this Institution I need hardly add that such an addition to the *load* to be carried, *at a given speed, and on a fixed draught of water*, must involve an increase in the size of the ship, very sensibly exceeding the mere increase in load.

"Before leaving this part of my subject, I would call attention to the fact (apparent in the tabular statement) that the weight of the auxiliary armament in the new battle-ships is practically equal to the total weight of armament proposed for the Fury design in 1870, the latter ship being of nearly 10,500-tons displacement.

"I would also make the following extract from the Parliamentary Papers, although it is not possible for me to give any details at present:—

"'A liberal allowance of weight has been made (in the design) for the protection of the guns, and the guns' crews, as well as for the rapid transport of the ammunition, and its protection in all the stages of its passage from the magazines to the guns.'

Armour protection of new turret ship design.

"This cannot be better described than by the following extract from the First Lord's statement to Parliament:—

"'The armour protection of the hull proper includes two principal features:—

"'(1) A belt, 8½ ft. broad, extending over two-thirds of the length of the vessel, and having a maximum thickness of 18-in. armour. Transverse armoured bulkheads complete the belt, a 3-in. steel deck is fitted above it, and a strong protective under-water deck completes the protection before and abaft the belt.

"'(2) The broadside above the thick belt is protected, to a height of about 9½ ft. above water over a considerable portion of the length, by 5-in. armour. Screen bulkheads similarly armoured enclose the central battery.

"'The protection of the heavy guns consists of 18-in. armour on the turrets, and 17-in. on the redoubts protecting the turret-bases, &c.'

"An inspection of *Pl. 26a* and *26b* will make this description clearer. It will be seen that each turret stands in a separate battery or redoubt, which rests upon the protective deck, and is strongly armoured for the defence of the turret bases and loading apparatus.

Victoria and Sans Pareil.

This system has been previously carried out in the Victoria and Sans Pareil, in each of which there is only one turret.

"The belt armour rises 3 ft. above water, and extends 5½ ft. below water. Its longitudinal extent is sufficient to ensure that if the spaces before and abaft it and above the under-water protective

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deck were flooded, very small 'sinkage' and very moderate 'change of trim' would ensue. The maximum thickness of the belt armour is 18 in., as against a maximum of 20 in. in the Trafalgar; the minimum thickness at the ends of the belt is the same as in the Trafalgar—14 in. The proportion of the length protected by the belt is the same in both cases. Trafalgar.

"Above this thick armour belt and protective deck, the broadside is armoured with 5-in. steel for a length of 145 ft. and to the height of the upper deck amidships (9½ ft. above water). Oblique armoured bulkheads or screens extend across the protective deck, and meet the redoubt armour: thus completely enclosing a lightly armoured citadel with its top at the level of the upper deck (9½ ft. above water), having the same extreme length as the central battery, viz. 170 ft. Within the 5-in. steel armour on the sides coal-bunkers are built, extending from the belt to the upper deck, and having an athwartship thickness of 10½ feet. When filled with coal these bunkers would greatly reinforce the defence; when empty the minimum defence is 5 in. of steel, which is proof against all the smaller natures of quick-firing guns, and against many of the most destructive forms of attack from much larger guns. Coal-bunkers built in wake of the 5-in. armour.

"In the Trafalgar (see *Pl.* **26**) the two 'turrets stand at the ends of a long armoured citadel extending to the full breadth of the ship: with vertical armour on the sides (varying in thickness from 16 to 18 in.), rising to a height of about 11 ft. above water,' according to the original design. In the completed ship this height will be about 10 ft. The upper deck over the citadel is plated with 3-in. steel. The distance between the centres of the two turrets is about 150 ft.: and the central battery between the two turrets (as already stated) has an extreme length of less than 110 ft. and a length along the broadside of about 65 ft. Trafalgar.

"In the new turret ship, as already explained, it has been necessary to provide a much longer central battery (about 170 ft. in extreme length) to accommodate the more numerous and powerful guns in the auxiliary armament; and the turrets are placed about 200 ft. apart. Consequently, if the citadel system embodied in the Trafalgar had been repeated, the length of the thickly armoured sides would necessarily have been considerably increased; and a great additional weight and cost of armour, &c., would have been incurred if the same thicknesses had been maintained; or a considerable thinning of the armour, &c., made necessary if the same total weight had been adhered to. New turret ship.

"No point in the new designs received more careful consideration than this. In order to elucidate the matter, alternative designs were Alternative designs.

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prepared for ships of the same displacement, identical in all respects, except as regards the adoption of the 'citadel' or the 'separated redoubt' systems. Some of these designs are described in the Parliamentary Papers; I will briefly note one instructive comparison.

"Two outline designs were prepared—one closely approximating to the turret-ship proposed to be built, the other for a ship of the same dimensions and displacement, but with a continuous citadel. The same total weight was allowed in both designs for the protection above the belt armour—on the sides, round the turret-bases, and on the turrets. Except as regards the adoption of (1) a citadel, or (2) of redoubt and thin-side armour, the ships were absolutely identical.

"In the citadel-ship, with the fixed total weight for protection, the thicknesses of armour found to be practicable were: On turrets, 15 in.; on citadel in wake of turrets, 14 in.; on sides of citadel (rising to 11 ft. above water), 12 in.

"In the other design the practicable thicknesses were: On turrets, 18 in.; on redoubts (protecting turret bases), 17 in.; on broadside (rising to about 10 ft. above water), and on 'screen bulkheads' (completing this thin armour across the ship), 4 in. to 5 in. That is to say, the latter design gave 3 in. greater protection to the stations of the heavy guns, at the cost of reducing the thickness of armour on the sides from 12 in. to 5 in., and lowering it about 1 ft. In the redoubt arrangement the 3-in. steel deck (as already explained) was situated at the level of the upper edge of the belt (3 ft. above water), and in the citadel arrangement, at the top of the citadel armour (about 11 ft. above water).

Facts placed before the Committee of naval officers.

"These and other facts having been placed before the naval officers attending the meeting convened by the First Lord, the following decisions were arrived at:—

"'(*a*) That it was preferable to have two separate strongly protected stations for the four heavy guns, rather than to have a single citadel.

"'(*b*) That on the whole the 4-in. armour amidships, from the belt deck to the main deck, associated as it would be with the internal coal bunkers, subdivided into numerous compartments, might be considered satisfactory; but that if armour weight became available, it could be profitably utilised in thickening the 4-in. steel above the middle portion of the belt.'

"I would draw particular attention to the first of these conclusions, since it expresses a most important distinction between the two systems of protection.

Separate redoubts.

"With separate redoubts, placed far apart, the two stations are isolated, and there is practically no risk of *simultaneous disablement*

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by the explosion of shells, or perforation of projectiles from the heaviest guns. Each redoubt offers a small target to the fire of an enemy, and its weakest part—the thick steel protective plating on the top—is of so small extent that the chance of its being struck is extremely remote. Serious damage to the unarmoured turret bases therefore involves the perforation of the thick vertical armour on the redoubts.

Citadel.

"With a single citadel, extending the full breadth of a ship, the case is widely different.

"Over a comparatively large area of the protective deck plating in the neighbourhood of each turret, perforation of the deck, or its disruption by shell explosions at any point, involves very serious risk of damage to the turret bases and the loading apparatus. In fact, such damage may be effected and the heavy guns put out of action while the thick vertical armour on the citadel is uninjured. Moreover, as the turrets stand at the ends of a single citadel, there is a possibility of their simultaneous disablement by the explosion of heavy shells within the citadel.

Traverses in citadel.

"This last risk may be minimised (as in the Nile and Trafalgar) by constructing armoured 'traverses' within the citadel; but it cannot be wholly overcome, so long as both turrets stand in one armoured enclosure.

"It may be thought that the risk of damage to a 3-in. steel deck situated 11 ft. above water is remote; but I think the facts are as stated, when actions at sea are taken into account.

"For example, if a ship of 70 to 75 ft. beam is rolling only to 10 degrees from the vertical, which is by no means a heavy roll, she presents a target having a vertical (projected) height of 13 to 14 ft. to an enemy's fire, and even if she is a steady, slow-moving ship, she will do this four or five times in each minute.

"Now, at this angle of inclination, assuming the flight of projectiles to be practically horizontal, even the thickest protective steel decks yet fitted in battle-ships are liable to serious damage from the fire of guns of moderate calibre, and this danger is increased by the employment of high explosives. Of course I do not mean to say that this damage is to follow from fire intentionally aimed at the protective deck; but with a great and sustained volume of fire, such as is possible with a powerful auxiliary armament, and especially with quick-firing guns, it is obvious that there is a very real danger of chance shots injuring seriously the wide expanse of the protective deck at the top of a long citadel.

"Again, it must be noted that the chances of damage to a deck

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placed 10 or 11 ft. above water, and with large exposed surfaces in the neighbourhood of the turrets when a ship is inclined or rolling, are greater far than those of a deck 7 or 8 ft. lower, and with 5-in. armour on the sides protecting the deck from the direct impact of shells containing heavy bursters. It is for the naval gunner to estimate these chances of injury; but, unless I am greatly mistaken, their verdict will be that a far greater number of shots are likely to strike at a height of 8 to 10 ft. above water than at a height of 4 to 5 ft.

"These considerations, I submit, amply justify the selection of the separate redoubt system, in association with the thin side armour above the belt, and the lowering of the protective deck to the top of the belt in the new designs.

"It may be urged that, if the redoubt system be adopted, it should be associated with side armour and screen bulkheads of greater thickness than 5-in. steel, and more strongly backed. This is perfectly practicable, but necessarily costly, involving an additional load of armour, and a corresponding increase in the size of the ship.

The Resistance experiments.

"The Board of Admiralty, and the officers called into council, had in their possession, when considering this question, the most recent and complete experimental data obtained by firing against the Resistance, with guns of various calibres (including quick-firers), projectiles of all patterns, and explosives of different kinds.

"With this information in their possession, the Admiralty pronounce the thin armour above the belt to be 'satisfactory,' and give effect to that decision in the designs. Sir Edward Reed, in his letters to *The Times* and elsewhere, challenges this decision, and uses very strong language in its condemnation; but, so far as I am aware, he can have no experimental data to go upon, and his objections seem to rest on purely hypothetical assumptions of what kind and extent of damage is likely to happen to a ship, lightly armoured above the belt, when she comes under the fire of an enemy's guns.

Sir Edward Reed.

Respective provinces of the naval architect and the naval officer.

"Apart from any expression of personal opinion, I would submit that it is for the naval architect to prepare alternative plans, showing possible dispositions of the protective material, within the limits of weight available in a design. Having done this, it is not his province, but that of naval officers, to determine from their knowledge of gunnery, what are the nature and extent of the damages likely to be done in action, and to choose that disposition of the armour which they consider has the balance of advantage. This is the course which has been followed by the Admiralty in dealing with the disposition of the armour on the new designs.

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"From passages occurring in Sir Edward Reed's letters and elsewhere, it seems that he doubts whether the First Lord and his advisers, who made the selection, understood what they were doing. I leave it to these gentlemen to answer for themselves, if they think it necessary; and anyone who will read through the Parliamentary papers will be able to judge whether any answer is required. I think that none is needed on the face of the published documents.

Fair statement of Sir Edward Reed's views.

"It is, I believe, a fair statement of Sir Edward Reed's views to say that his chief objection to the proposed arrangement of armour in the new designs, as compared with the Trafalgar, is that the *thick armour* on the side rises only 3 ft. above water, instead of 11 ft. as designed for the Trafalgar, and about 10 ft. as completed. He speaks of 'stripping a wall of armour 8 ft. high off the sides of the proposed battle-ships'; although in another place he is good enough to admit that 'the 5-in. armour which rises 9½ ft. above water is better than nothing, but it is a miserably inefficient substitute for the 18-in. armour, which (as compared with the Nile and Trafalgar) has been stripped off.' And yet, again, he says:—'These ships are in principle, in so far as the defensive armour of the hull is concerned, neither more nor less than ships of the universally condemned Admiral class.'

Extent of armour belt in Admiral class and in the new designs.

"Taking the last statement first, I wish to challenge its accuracy, and to point out the essential differences between the Admiral class and the new designs, in the matter of 'the defensive armour of the hull.' In the Admirals the thick armour belt extends over about 40 to 45 per cent. of the length, as against 66 per cent. in the new ships. Above the belt in the Admirals cellular sides, extensive subdivision and coal form the only protection; in the new ships these arrangements are supplemented by the long lightly armoured citadel above described, and the broadside is made secure against all the smaller natures of quick-firing guns, as well as against many of the most destructive projectiles from much larger guns, to a height of 9½ ft. above water—practically to the same height as the thick armour goes in the completed Trafalgar, and over as great a length amidships. Surely these are differences of the highest importance. They involve a very large expenditure of weight and money in new ships, as compared with the Admirals, and add greatly to the defence. Yet they are practically ignored by Sir Edward Reed; whose condemnation of the proposed arrangements has regard almost exclusively to the fact that the thick armour is to rise only 3 ft. above water.

Narrow water-line belts.

"He objects to the adoption of *narrow water-line belts* of thick

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armour in battle-ships generally, although I understand him to favour the use of such belts in cruisers. His contention, shortly stated, is that with such narrow belts there is a great risk that the damages done to the sides above the belt in action will speedily cause the ships to become unstable (in the transverse sense) and to reach a dangerous condition.

"Now, clearly this is a matter which turns chiefly, if not solely, upon the estimate that may be formed of the damage likely to be done in action. It is not a question of an abstruse nature, involving elaborate and scientific calculations of stability. Everyone can see that if a ship originally of high freeboard, carrying great weights of armament and armour aloft, could be brought down, by the rapid and wholesale destruction of her upper works, to a virtual freeboard of 2 to 3 ft. (the height of the thick armour belt above water), while those great weights of guns and armour, &c., still remained aloft, she would reach a dangerous condition, and would be readily capsized. On this point there can be no difference of opinion. Moreover (as I pointed out several years ago in a published correspondence with Sir Edward Reed), this element of danger, if it really exists, is not sensibly affected by carrying the narrow belt throughout the length instead of stopping short of the extremities.

The pith of the whole question.

"Here, then, lies the pith of the whole question. Are such extensive damages likely to be done in action, and to be of a character that will virtually throw open to the sea the portions of the ships lying above the narrow armour belts? Is it to be regarded as impossible to keep ships thus armoured from capsizing under fire? What has been the general verdict of naval authorities on this matter, as evidenced in ships actually built?

Foreign navies.

"Reference to the diagrams already used in connection with the dispositions of armament gives the answers to these questions. It will be seen that in the recent battle-ships of nearly all foreign navies, belts of thick armour as narrow as, or narrower than, those condemned by Sir Edward Reed have been and are being adopted. Up to date, in most foreign ships, these narrow belts have not been associated with as effective a cellular construction of the sides as is possessed by the Admirals and other belted ships of the Royal Navy. Nor has coal protection been similarly cared for and made possible at the sides above the belts. Much less has there been provision hitherto in foreign ships of lightly armoured citadels above the belt, such as are proposed for the new ships. It is true that many of these foreign ships have belts going to the bow and stern; but that fact does not affect our present discussion, and it may be assumed,

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from what has been done and is doing abroad, that naval and professional authorities there, as well as at home, do not share the apprehensions expressed by Sir Edward Reed. By common consent his estimate of the serious risks inevitable with narrow belts is not endorsed.

"Below I give a tabular statement showing the character of the water-line protection in a number of British and foreign ships, and the vertical distances to which the armour is carried above and below the designed load water-line.

	Armour as Designed.				Beam of Ship.	
	Depth of Belt below Load Water-Line.		Height of Thick Side Armour above Load Water-Line.			
	ft.	in.	ft.	in.	ft.	in.
Bellerophon	6	0	5	6	56	0
Hercules	6	0	8	6	59	0
Devastation	5	0	(4′ 2″ amidships and aft; 6″ forward).		62	3
Fury (design cancelled)	5	0	4′ 2″ amidships; 6″ forward.		62	3
Dreadnought	5	6	(11′ 0″ amidships; 3′ 0″ before and abaft citadel).		63	10
Inflexible	6 (7′ 0″ at fighting draught).	0	9 (8′ 8″ at fighting draught.)	8	75	0
Trafalgar	5	6	(11′ 0″ amidships; 3′ 0″ before and abaft citadel).		73	0
New Designs	5	6	3	0	75	0
Admiral Duperre (French)	5	6	2	6	67	0
Admiral Baudin (French)	5	3	3	0	70	0
Magenta Class (French)	4	10	2	6	66	0
Sinope Class (Russian)	5	0	(11′ 0″ amidships; 3′ 0″ before and abaft base of battery).		69	0
Italia and Lepanto (Italian)	Armoured deck at side is 6 ft. below water as designed.				74	0
Duilio and Dandolo	6	0	(10′ 0″ amidships; 2′ 0″ before and abaft base of citadel).		65	0

"It is perfectly obvious from this table that so far as the belt proper is concerned, the new ships are on practically the same footing as recent ships built in this country and abroad. But, I must repeat that they have above the belt a lightly armoured side, which most foreign ships have not. They are to be armoured, in fact, to 9½ ft. above water, as against 2½ to 3 ft. in most foreign ships; the total depth of armoured side is to be 15 ft., as against 7½ to 8½ ft. in some

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of the largest foreign ships. Relatively to those ships, therefore, the new designs clearly occupy a good position; and that is the true test.

Narrow armour belts associated with armaments carried high above the water.

"In passing, it will be noted from the plates already referred to that narrow belts have in nearly all cases been associated with dispositions of armaments placing the guns and their armour protection high above water and far apart.

"I do not desire to enter into any lengthy explanation of the reasons which have led to this general adoption of narrow armour belts. Probably the chief reason is to be found in the fact that from the outset the depth to which armour has been carried *below water* has been very moderate.

Depth of armour below water-line diminished.

"In recent years this depth has been somewhat diminished, as will be seen from the table, both absolutely and in relation to the beam of ships. Of course, it may be argued that the depth of armour below water ought to have been increased as ships became larger and broader. That is a separate question, and just now we are concerned chiefly with matters of fact, and with comparisons of our ships with foreign ships. As a matter of fact, armour protection goes to a moderate depth below water in all cases. Consequently, it is quite possible, and in fact quite common, for the lower edge of the armour to be *emerged*, either by a very moderate inclination of the ship, or by her motion through still water, or by the movement of waves along her sides, or by her rolling in a seaway; as well as by many possible combinations of these circumstances. This emergence of the armour involves the exposure of the unprotected bottom, and chance shots entering below the armour may destroy the ship, and inevitably will cause damage that must be practically irremediable under the circumstances of action, and must result in the entry of large quantities of water into the vessel, even though she may be kept afloat by her water-tight subdivisions.

Risks to ships below the armour.

"The unarmoured under-water portions of the sides and bottoms of war-ships are, moreover, exposed to serious damage in action by submarine torpedoes and by ramming; but it is unnecessary to dwell on the point.

Risks compared.

"Contrast with these undoubted risks, the risks involved in damage to the sides immediately above the armour belt, and also *above the normal water-line*. The consequences are clearly not so serious in many respects. Something may be done towards stopping or limiting the inflow of water when the damage is done above water. There is no head of water to deal with, as when the bottom below the armour is broken through. The projectiles which enter have opposed to

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them the protective deck at the top of the belt, and must pass through or seriously damage it before any of the vitals (boilers, engines, magazines, &c.) are attacked. And in the new ships (as already explained) projectiles must pass through the light armour before they can reach most portions of that deck—an immense advantage when high explosives are used.

"Given, therefore, armour reaching to a moderate depth below water, a narrow belt is not such an unreasonable mode of protection as has been assumed, and the almost universal practice of adopting it is seen to have some justification.

"I will only add one remark, which I feel disposed to apologise for, although it expresses a truth often overlooked in these discussions, viz., that the integrity of the unarmoured portions of a ship's bottom lying below the armour is as essential to the maintenance of her stability as the integrity of the sides above the armour belt. Yet it is no exaggeration to say that very frequently, when the gravest fears are expressed of what may result from damage to the out-of-water portions of ships, it is virtually assumed that the parts under water, when floating in still water, are not liable to injury in action. Such assumptions are clearly inadmissible.

"This naturally leads me to deal with one illustration, avowedly couched 'in simple language,' which Sir Edward Reed has put before the public lately.

Sir Edward Reed's letter to the *Times*.

"In his letter to the *Times*, above quoted, it is stated that the Nile could list over to about 17 degrees 'before the top edge of the armour disappeared beneath the water;' while not a hint is given in any language, 'simple' or otherwise, that under this assumed condition the lower edge of armour on the other side of the ship would be about 5½ feet out of the water, leaving 5½ feet of unarmoured bottom exposed.

"Other examples might be given of the one great fact apparent throughout Sir Edward Reed's utterances on this question of armour protection, viz., that there is no general or comprehensive survey and proportioning of the many risks that have to be encountered in action, but a restriction of the discussion to one, and that, by common consent, not the greatest risk.

Offensive powers disregarded.

"Throughout his treatment of the new designs practically no regard is bestowed upon their 'offensive' powers, and one might fairly say that the discussion proceeds as if the new ships were to be built chiefly with a view to make them efficient locomotive floating targets, capable of withstanding the effects of gun fire, and not capable of inflicting as well as receiving damage. To mention the point seems

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to me sufficient, without dwelling upon the incompleteness of this mode of treatment. In short, at least equal regard must be had to the provision of powers of offence as well as of defence in the determination of that compromise, which under existing conditions is the best disposal of the available capital in displacement and cost of any new type of war-ship.

"Having made these general statements, I now wish to record my opinion that, in his haste to condemn the system of protection in the new designs, Sir Edward Reed has altogether failed to appreciate what would be involved in giving effect to his views.

"I have shown that he has not recognised the great development of the auxiliary armament, and the influence of that development on the design generally; I have indicated the practical impossibility of effectively working that armament without placing it in a long central battery, and have pointed out the fact that, with the citadel system and this long central battery, a very great increase in weight of armour, as well as size and cost of ship, must result.

"Hereafter I shall deal with Sir Edward Reed's remarks on the supposed extravagant displacement of the new designs.

"But, for the moment, I simply wish to inquire if Sir Edward Reed, before writing in the terms he has employed, made any estimate of the increase in size and cost which would be inevitable, if the same qualities, the same kind and disposition of armament, the same speed and coal endurance, were obtained in a vessel armoured as he suggests.

"Of course Sir Edward Reed may consider that the armament is wrong in its character or badly disposed, and he may have had in his mind some ideal plan that, in his judgment, would be more satisfactory. If that be the case, he does not say so in his published letters or speeches, and the omission is to be regretted. But, if he should have had such an alternative in his mind, then it must be stated that the issue as to armour protection is confused by introducing such modifications into the comparison. Moreover, it will not be universally admitted, that on such questions as are involved in the character and disposition of armaments for battle-ships, the views of Sir Edward Reed are to be accepted in preference to those of the Admiralty and its naval advisers.

Description of the barbette design.

"Although the foregoing descriptions have dealt chiefly with the turret ship design for a first-class battle-ship, in order that a comparison might be made step by step with the Nile and Trafalgar, it is proposed to build only one such ship out of the eight ships to be laid down.

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"This action is described as follows in the Parliamentary Papers:—

"'BARBETTES' *versus* 'TURRETS.'—'The advantages and disadvantages of both systems having been reviewed, it was agreed (in view of the vessels existing in foreign navies or now under construction) that the barbette arrangement in design was to be preferred in a battle-ship intended for general sea-going purposes. Sir Arthur Hood recommended that of the ships proposed to be laid down in 1889–90, in the dockyards, one should be on the turret system.' "Barbettes" *versus* "turrets."

"I will now proceed to summarise the chief points of difference between the designs (*Pls. 8a* and *8b* and *Pls. 26a* and *26b*), to some of which allusion has already been made.

"In the barbette ships the freeboard at the ends is increased to 18 feet, or 6¾ feet more than the freeboard in the turret ship, and about 7 feet 4 in. more than in the Trafalgar as completed.

"The heavy guns are carried 23 feet above water, as against 17 feet in the new turret ship, and about 15 feet as designed, or 14 feet as completed, in the Trafalgar.

"It is unnecessary for me to dwell upon the great advantages that should result from these changes in the power of maintaining speed and fighting guns in a seaway.

"In the Royal Navy a very large proportion of our most recent and powerful ships are of moderate freeboard, carrying their guns only 12 to 14 feet above water; whereas in foreign navies, in recent years, the heavy guns are chiefly carried from 22 to 28 feet above water, and the freeboard is high. Height of batteries above water.

"The decision of the Admiralty to largely adopt the barbette design is avowedly based on these facts, and arrived at with a full knowledge of the relative advantages and disadvantages of the turret and barbette systems, after considering designs for turret ships with guns placed at equal height above water, and with the same freeboard as the barbette ship.

"It will be obvious that the increase in height of freeboard and of guns above water can only be secured by means of additional hull-weights, and re-arrangements of the armour. What has been done is this: the turrets have been abolished, and the weight of armour, &c., is utilised in adding to the height of the redoubts in which the turret bases stand. The barbettes thus formed are strongly armoured from the 3-inch protective deck above the belt upwards, and are divided into two storeys. In the upper storey stand the turn-tables carrying the heavy guns, in the lower storey will be placed the turning engines and other important portions of the equipment.

"In most barbette ships hitherto built, whether English or foreign, Existing barbette

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batteries and those now proposed.

the barbettes have been shallow armoured cylinders with plated bottoms, standing on light steel structures at a considerable height above the belt deck. Armoured tubes have been fitted to protect the ammunition when it is passed up from the magazines into the barbettes.

"This system greatly economises weight of armour, but the development of high explosives makes it possible that shells containing bursting charges of great energy might be exploded immediately under the floors of the barbettes. Consequently it has been decided in the new ships to adopt the alternative system, above described, although it involves a very large expenditure of weight and cost on armour.

Hydraulic gun mountings.

"The hydraulic system of mounting, working, and loading the 67-ton barbette guns to be carried out in the new ships will resemble closely that already successfully adopted in the Admiral class.

"As regards the disposition of the belt armour, protective deck, and 5-in. armour, as well as the protection of the auxiliary armaments, the barbette ships are identical with the turret design, already described.

Speed.

"It was originally contemplated to adhere in the new designs to the speed that had been first accepted for the Trafalgar, viz., 15 knots on the measured mile, with natural draught, and 16½ knots with forced draught. In working out the designs, it has been found possible to increase these speeds to about 16 knots natural draught, and 17½ knots with forced draught.

Based on Mr. Froude's experiments.

"These estimates of speed are, of course, based upon model experiments made in the Admiralty establishment at Haslar, by Mr. R. E. Froude, and upon our analysis of the results of speed trials of recent ships. It was with some surprise, therefore, that I found this estimate questioned by Sir E. Reed in the following passage, in his letter published in the *Times* of March 22nd :—

"'There is a slight alleged increase of speed, ½ a knot.' 'This assumed increase of speed is, however, fallacious, because, as a matter of fact, the Nile and Trafalgar, having 12,000 horse-power to drive 12,000 tons of ship will obviously have the advantage in speed of ships which have but 13,000 horse-power to drive 14,000 tons of ship.'

"This kind of criticism is so extremely popular in its form that I am almost disposed to apologise to the Institution for explaining why we may reasonably anticipate a higher speed in the new ships, apart from the practical certitude obtained by means of the model experiments and trials of other ships.

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"The new ships are to be 380 feet in length, as compared with 345 feet for the Trafalgar. They will be 14,150 tons displacement, as against 12,000 for the Trafalgar as designed, and 12,500 tons for that ship as completed. Our model experiments show that, for speeds from 10 knots up to 16 knots, the resistances of the two forms are, for all practical purposes, equal; the greater length of the new ships compensating for their greater displacement.

Model experiments as to speed.

"But at speeds higher than 16 knots the longer form begins to gain sensibly on the Trafalgar, and at 17 knots the Trafalgar form would require about 12 per cent. greater power than the new ships. At 17½ knots the Trafalgar form, if it could be driven, would require at least 30 per cent. greater power than the heavier but longer ships. Now this speed of 17½ knots is what is estimated as the maximum (forced draught) performance with 13,000 horse-power in the new ships; while with 9000 horse-power (natural draught) we hope to reach about 16 knots.

"The Trafalgar's specified powers are 8000 horse-power natural draught and 12,000 horse-power forced draught; and I am happy to be able to say that on the measured mile these powers ought to give her speeds of about 15½ knots and 16¾ knots respectively.

"Put in another way the facts are these.

"The Trafalgar form is well adapted for the maximum speed intended in the design, 16½ knots; it is not well adapted for higher speeds, and, even if large additional power could be developed, very little extra speed would be gained. On the other hand, the greater length of the new designs renders them suitable for speeds up to and beyond 17½ knots, and if additional power were developed the gain in speed would be appreciable.

"I must refer to another passage in Sir Edward Reed's letter before passing on; it runs as follows:—

"'If the increase of size given to them (the new ships), and the increased cost to be bestowed upon them, were to be judiciously applied by competent persons, the result would be ships having a speed of 20 knots, with a coal supply far beyond that which these ships are to possess. Considering how cheaply speed is now obtained, I cannot myself deny that I should like to see our great ships able easily to overtake any enemy's fleet.'

Sir Edward Reed's letter as to speed.

"I pass by for the present the allusion to 'competent persons,' and wish to direct attention to the statement made as to the possible increase in speed. Taking the passage as it stands, I find no allusion to any diminution in armament; the letter, as has been shown, recommends no decrease in armour protection or coal supply,

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but the reverse; and yet these grand results are alleged to be possible without increase of size.

"I do not desire to make this discussion and criticism a personal matter; but I may be permitted to mention that my professional work in recent years has given me a somewhat intimate acquaintance with what is involved in the attainment of high speeds. Nor do I consider that we are at the end of the remarkable progress in marine engineering which has facilitated, or rather I should say has rendered possible, recent advances. On the contrary, I recognise many promising methods of getting greater power in relation to weight as likely to influence further practice, and no one will welcome them more heartily than I.

"We are considering at present, however, the case of great battle-ships to be built immediately wherein experiments in engineering are clearly undesirable, and where the certain possession of endurance as well as maximum speed is of primary importance. And apart from this fact I entirely challenge the statement that when speeds of 17 to 20 knots are in question for battle-ships, even of the largest size, increase in speed is to be 'cheaply obtained.' Experience and experiments are contrary to such an assertion, and the onus of proving it to be true lies on the person who makes it.

"Figures might be multiplied to show that my contention is correct; but I will only give two illustrations. In the new battle-ships it requires the horse-power to be doubled in order to pass from 14 knots to 17 knots; but a further doubling of the power would not add another 2 knots. This will scarcely be thought a 'cheap' increase of speed.

High speeds in merchant ships.

"In the mercantile marine, speeds of 20 knots are being attained in steamers of 12,000 to 13,000 tons' load displacement and 26 feet draught, but 500 to 560 feet in length, and having a ratio of beam to draught and length which is altogether inadmissible for a war-ship carrying heavy weights of armour and armament high above water. But even under these conditions speed is not 'cheaply' increased from high speeds such as 17 knots to the still higher speed of 20 knots. To take an actual case within my knowledge, the ratio of the power at 20 knots to that at 17 knots was found to be 2 to 1.

"In illustrating the truism that great expenditure of power is inevitable when such a speed as 20 knots is obtained, I do not assert that battle-ships may not be produced having that speed. What I challenge is the statement of Sir Edward Reed that in ships of the size and cost of the new battle-ships 'competent persons' could

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produce ships as heavily armed, more heavily armoured, 'having a speed of 20 knots, with a coal supply far beyond that which these ships possess.' That statement could not have been made if he had given even the most moderate amount of consideration to the enormous power and weight of machinery necessarily required to obtain 20 knots with any possible form of ship; to the serious difficulties involved in providing space for the accommodation of the propelling machinery, boilers, and coal, as well as magazines, store-rooms, &c., under protection in the hold; and to the fact that the maximum draught of water being necessarily a fixed quantity, changes of form, in length especially, and increase in weights of hull and armour, would be unavoidable. All these points are matters of fact, not of opinion. They lie on the very surface of the problem, and they obviously require to be dealt with in a careful scientific manner, not in an airy general style, taking for its basis the idea that speed is now 'cheaply obtained.'

"Before leaving this question of speed, it may be well to point out the fact that these new battle-ships will possess speeds exceeding those of nearly all battle-ships built or building. They will form a squadron of identical character and qualities, capable of proceeding and manœuvring together. Taken as a group, they will certainly be 'able easily to overtake any enemy's fleet.' And what is equally important, they will, under the new programme, be associated with a number of very swift cruisers and torpedo gunboats, thus constituting a force complete in all respects, and of unrivalled power as well as speed.

Coal supply and endurance.

"It was decided, after full consideration, that the new ships should ordinarily carry 900 tons of coal, as in the Trafalgar; and be capable of covering the same distance, viz., about 5000 knots at 10 knots.

"Like the Trafalgar, the new ships will have a bunker capacity sufficient to carry a much larger quantity of coal if desired.

"But whereas any increase above 900 tons in the coal put on board the Trafalgar necessitates an increased draught and some loss of speed, in the new designs provision is made (in the form of the so-called 'Board Margin') for an unappropriated weight exceeding 500 tons to be carried at the designed load draught and at the full speed.

"Strictly speaking, therefore, the case stands thus:—

Trafalgar—coal at load draught, 900 tons.

New designs—coal at load draught and unappropriated weight, about 1400 tons.

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"If the unappropriated weight should be assigned to coal, it would give the new designs a coal endurance of nearly 8000 knots at 10 knots.

Radius of action with coal supply.

"Apart from any such increase in coal, however, the 900 tons proposed is a very large supply in relation to expenditure; larger, in fact, than that of nearly all first-class battle-ships. Take for example the Thunderer and Devastation as completed. They can cover about 4700 knots at 10 knots. Their full speed for continuous steaming in smooth water is estimated at 12½ knots, and they can cover about 2700 knots. At that speed with 900 tons of coal the new ships could cover about 3500 knots. At the highest speed contemplated for smooth water, continuous steaming—about 16 knots—the new ships could cover about 1900 knots. The forced draught speed is never intended to be maintained for more than four to five hours continuously; so that an estimate of coal endurance under these conditions is worthless for any practical purpose.

"There is one class of ships in the Royal Navy (the Admirals) which has an unrivalled coal endurance, and one ship in that class, the Collingwood, which surpasses the others. This vessel (the Collingwood) is selected by Sir Edward Reed as a standard of comparison on which to base a hostile criticism in dealing with the coal capacity of the new ships. Nor is this all, as the following passage will show. He says:—

Collingwood.

"'When the Collingwood was designed, she was provided with engines of 7000 horse-power, and a coal supply of 950 tons. The proposed new ships are to have 13,000 horse-power, and in the same proportion should carry 1760 tons of coal; but, incredible as it may seem, 900 tons of coal is all that is to be allowed them.'

"It will be sufficient to indicate in the briefest fashion the misleading character of the comparison here made.

"(1) The 7000 *horse-power* mentioned for the Collingwood was with *natural draught;* the 13,000 *horse-power* for the new ships is with *forced draught*, their natural draught power being 9000 horse-power.

"(2) The new ships will have triple expansion engines, which may be assumed to be at least 15 per cent. more economical in coal consumption than the compound engines fitted in the Collingwood.

"(3) The Collingwood can steam about 7000 knots at 10 knots, if she starts with 900 tons of coal, her full authorised quantity. The new ships with the same weight of coal will steam 5000 knots at 10 knots: to cover 7000 knots they would have to start with about 1250 tons of coal, or 350 tons more than the ordinary supply of 900 tons. This 350 tons is (as explained above) less by more than

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150 tons than the unappropriated Board Margin which has to be carried at the load draught and full speed in the new ships.

"The coal endurance of H.M. ships has to be regulated by other considerations than those of mere comparison with the corresponding feature in foreign ships. To this point I referred at length in the discussion on Sir N. Barnaby's paper on 'Fuel Supply,' published in the *Transactions* for 1887. But it may be interesting to state that no foreign war-ships, except, perhaps, the Italia and Lepanto, have coal endurances approaching those of the new designs. And further, it must be remarked that published statements of coal endurance for foreign ships are frequently based upon mere bunker capacity, and not upon the coal carried at the reputed load-draughts and full speeds.

Remarks on the size of new battle-ships.

"In conclusion, I desire to make a few remarks on the criticisms that have appeared with reference to the very large size and displacement of the new battle-ships.

"These criticisms may be arranged in two groups.

"First: What may be termed the 'too many eggs in one basket' class of objection.

"Secondly: Those which allege that the ships have been made unnecessarily large in relation to the qualities of speed, coal endurance, armament and protection they are intended to combine.

"The first class are criticisms of the policy represented in the designs, and these I shall leave unanswered, since the Board of Admiralty are responsible for that policy, and I am their technical adviser. But it will be noted that the procedure followed in deciding on the designs involved a selection from amongst a number of alternatives representing ships of various classes, sizes, and costs.

"Independently of actual experience in a great naval war, and the experimental demonstration of the relative advantages and disadvantages of a group of smaller ships, as against a less numerous squadron of ships individually more powerful—the aggregate outlay in each case being the same—the choice between the two policies of construction must be largely a matter of opinion. But I presume it will be admitted that the Admiralty and its naval advisers constitute as competent a body as can be found to deal with such matters.

"Moreover, it must be noted that in the existing fleet we already have large numbers of battle-ships of less size and cost than the projected vessels; and that the new programme associates with the eight first-class battle-ships, two second-class battle-ships of moderate

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size, and a very large number of swift cruisers. So that taking the fleet as a whole all views may be considered to be represented.

"The second class of criticism is one that peculiarly concerns myself as the responsible designer of the ships; for it really amounts to a charge of professional incompetency. If these ships have been made larger and more costly than was necessary to secure the combination of qualities decided on by the Board of Admiralty, then I, primarily, and my colleagues and assistants in the constructing and engineering department of the Admiralty are clearly to blame.

"Sir Edward Reed has made this charge of 'incompetency' in unmistakable language in the passage above quoted when dealing with speed.

"And further on in his letter he states:—'The day for getting the best possible ships out of our Whitehall office is past and gone.'

"It would have been interesting if he had fixed the date from which this decadence in the 'Whitehall office' began; but that is not done in the letter from which I have quoted.

"In dealing with this serious allegation, I desire, however, to sink all personal feeling, and to disregard the attack made on the 'competency' of the Admiralty professional officers. My intention is to put a plain statement of facts before the Institution, and to allow the facts to speak for themselves. Fortunately, my task is easier, because Sir Edward Reed has himself requested that the 'comparison which he has set up between the Nile and Trafalgar, and the proposed ships,' may be tested; and this I will now proceed to do. To make the comparison as precise as possible, I will take the new turret ship design, and, to make it complete in this place, I will repeat some figures already given.

"On the tabular statement for the various classes of battle-ships on pages 190–193, the principal particulars for the Trafalgar (as *designed*) and for the new ships are compared. Originally the Trafalgar was intended to have a load displacement of 12,000 tons, and a mean load draught of 27½ ft., trimming 1 ft. by the stern, with 900 tons of coal on board.

"It is explained, however, in the Parliamentary Papers, that owing to various additions made during construction, and to other causes, the completed Trafalgar will be 500 tons heavier, and draw about 10 in. more than designed. For purposes of comparison, therefore, she must be taken as a vessel of 12,500 tons, having a mean draught of nearly 28½ ft., and an extreme draught aft of 29 ft., with 900 tons of coal on board. When she fills up her bunkers to 1200 tons she will draw about 6 in. more.

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"Here, then, we have the true starting point in the comparison with the new ships: a vessel of 12,500 tons drawing 28½ ft. mean and 29 ft. extreme. True starting point for Trafalgar.

"With these facts before them, the Admiralty decided that in the new designs the original mean draught intended for the Trafalgar (viz., 27½ ft.) should not be exceeded; and this decision is set out in the Parliamentary Papers.

"Before this Institution it is scarcely necessary for me to dwell upon the great influence which this decision to keep to a draught shallower by 1 ft. than the actual draught of the Trafalgar must have had on the new designs. But Sir Edward Reed, although himself a naval architect, ignores the detailed statement of facts in the Parliamentary Papers, and makes no allusion to the consequences.

"I will very briefly correct his omission, and state what the change in size would be if the Trafalgar were re-designed to float at the 27½ ft. mean draught, carrying the same armament, the same equipment, the same armour protection, and to steam at the same speed as the actual Trafalgar. To fulfil these conditions would involve an extra length of about 20 ft., and would require a displacement of about 13,000 tons.

"Keeping these figures in mind, let us turn to the new ships, which are to be 380 ft. long, of 14,150 tons displacement, and 27½ ft. mean draught.

"They are consequently of 1650 tons greater displacement than the Trafalgar as completed, but of 1 ft. less draught. They are of about 1100 to 1200 tons greater displacement than the re-designed Trafalgar floating at the same draught would be.

"Now let us see how this difference in displacement (1100 to 1200 tons) is made up; and here the ground has been cleared by some of the statements made in the preceding pages.

"The following are (in round figures) the excesses *in loads to be carried in the new ships*, quite independent of increase and size:— Excess of load to be carried in the new ships.

	Tons.
Auxiliary Armament	300
Increased Complement, &c.	60
Board Margin of Weight (equivalent to enlarged Coal Supply)	520
Weight of Armour, &c., to lift Turret Guns two feet higher above water than in Trafalgar	150
Total increase in load	1,030

"To carry this heavier load on the same draught (27½ ft.) as the re-designed Trafalgar necessarily requires a longer and larger ship, and therefore a heavier hull. Furthermore, in the new ships, as

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explained above, machinery of greater power than that in the Trafalgar is to be provided, not for the purpose of driving the larger ships as fast as the Trafalgar, but to obtain an absolutely higher speed, the difference in speed being at least half a knot, and possibly more, in favour of the new ships.

"The foregoing statement of facts will probably be found sufficient by members of the Institution to explain the increase in size of the new ships; and to illustrate the statement which I will now add. They have not been made any longer or larger than is absolutely necessary—under existing conditions of naval architecture and marine engineering—to fulfil the conditions laid down by the Board.

"My friend and colleague, Mr. Sennett, and I are perfectly acquainted with the savings in weight or equivalent increase in power and speed which would be possible if we had adopted certain new types of boilers or novel arrangements of machinery which have undergone limited trials with considerable success.

"We are, moreover, most favourably disposed towards the gradual developments of all systems which promise such beneficial results. But we do not consider it wise or right to make such experimental trials on ships of the magnitude and importance of these new battle-ships. And after the fullest consideration our advice to the Board has been to adhere to arrangements with which we have experience, and of which the success is assured.

"Before sitting down, I will add two or three statements which appear to be of some importance when dealing with the relatively large size of the new ships.

Board margin.

"First: They have been shown to be made large by the great *loads* of armament equipment and board margin they carry on a moderate draught at high speed.

"Omitting the board margin (or allowance for contingent additions during construction) the ships are of 13,600 tons displacement, and about 26 ft. 8 in. mean load draught. These are the figures strictly comparable with the other ships: using them, the table on p. 189 is instructive. . . . . .

"Second: The new ships, although of a displacement surpassing all previous battle-ships, are certain to be much more manageable than many of their predecessors with equal or greater length, and not possessing twin screws.

"Lastly, it will be seen that, since the increase in size is chiefly due to increase in load, the assumptions that have been made by Sir Edward Reed and others as to relative increase in cost are not well founded. I am not at liberty to make any statement respecting the

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Admiralty estimate of cost for these ships, for reasons which will be obvious. But this I may say, that, while the total weight of protective material in the new ships is greater than the corresponding total in the Trafalgar by something like 150 tons, the adoption of the 5-in. armour in association with redoubts, instead of a central citadel thickly armoured throughout, has the result of largely reducing the cost of the armour. This was not the reason, however, for the adoption of the system, as has already been explained. At the next meetings of the Institution this question of cost may be debated on the basis of ascertained figures, and I therefore say no more.

	Length.	Mean Draught.	Displacement.	Maximum Speed.
	ft. in.	ft. in.	Tons.	Knots per hour.
New Ships (excluding Board Margin	380 0	26 8	13,600	17½
Trafalgar (as designed) .	345 0	27 6	12,000	16½
Inflexible	320 0	25 3	11,880	13·8
Dreadnought . . .	320 0	26 9	10,820	14·2
Minotaur	400 0	26 9	10,690	14·4
Warrior	380 0	26 9	9,210	14·1
		Extreme draught.		
Italia	400 6	31 3	13,900	18
Lepanto	400 6	30 9	13,550	18
Sicilia	400 0	28 6	13,253	18
Amiral Baudin . . .	321 6	26 2	11,380	15

Defence of constructive department.

"The paper has extended to an unusual length, yet I venture to believe that this has been warranted by the importance and range of the subjects treated. It has unavoidably assumed a controversial character in certain parts; but I am not responsible for the circumstances, and I trust that nothing has been said by me which goes beyond fair reply or criticism. I have, in fact, been put upon my defence as a naval architect who holds a position of some public importance, and who should clearly cease to occupy that position if the allegations of incompetency that have been made so freely and publicly could be sustained. But, beyond any personal interest in the matter, I appear here as the representative and head of the Constructive Department of the Admiralty—the 'Whitehall Office,' which is said to be no longer capable of producing 'the best possible ships.' Apart from the fact that I am the head of that staff, and apart from any question of my personal competence, I desire to state that there never has been a time during my experience of the

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PARTICULARS OF BRITISH AND

	New Designs.		TRAFALGAR.
	Turret Ship.	Barbette Ship.	As designed.
Date of Design	1889.		1885.
Name of Designer	Mr. W. H. WHITE.		Mr. BARNES. Mr. MORGAN.
Length . . . feet	380 0		345 0
Breadth . . . „	75 0		73 0
Draught (mean) . . . „	27 6		27 6
Displacement . . . tons	14,150		*12,000
Freeboard . . Forward . . . feet	11 3	19 6	11 3
Freeboard . . Aft . . . „	11 3	18 0	11 3
I.H.P. . . . Natural draught . . .	9,000		8,000
I.H.P. . . . Forced „ . . .	13,000		12,000
Speed . . . Natural draught . . knots	16·0		15·0
Speed . . . Forced „ . . „	17·5		16·5
Coals carried at the designed load draught . . tons	900		900
Coal endurance at 10 knots . . . . knots	5,000		5,000
Armament . . Main	4 67 ton B.L.		4 67 ton B.L.
Armament . . Auxiliary	10 6 in. Q.F. 18 { 6 prs. Q.F. 3 prs. Q.F.	10 6 in. Q.F. 24 { 6 prs. Q.F. 3 prs. Q.F.	8 5 in. B.L. 18 { 6 prs. Q.F. 3 prs. Q.F.
Weight of Projectile (heaviest) . . . lbs.	1,250		1,250
Weight of Charge . . . . „	630		†520
Total weight of Armament . . . tons.	1,420	1,410	1,035
Weight of Auxiliary Armament . . . „	480	500	135
Height of centre of metal of heavy guns above designed water-line . . . . feet	17 0	23 0	15 0
Length of Belt . . . . . „	250 0		230 0
Greatest thickness . Side armour . . inches	18		20
Greatest thickness . Protective Deck . . „	3		3
Weight of Horizontal Armour Deck, Glacis Plates, &c. . . . . tons	1,100		1,040
Total weight of Armour and Backing, including Protective Deck . . . . „	4,550		4,400

* Displacement when complete, will be 12,500 tons.

† Now 630.

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Foreign Battle Ships.

Sultan.	Devastation.		Fury.	Dreadnought.	Inflexible.
As designed.	As designed.	As completed.	As designed.		
1868.	**1869.**	**1873.**	**1870.**	**1872.**	**1874.**
	Sir Edward Reed.			Sir Nathaniel Barnaby.	
325 0	285 0		320 0	320 0	320 0
59 0	62 3		62 3	63 10	75 0
25 0	26 2	26 8	26 2	26 9	25 4
†8,700	9,060	9,300	10,460	10,900	11,880
19 8 17 9	9 3 5 0	8 6 4 6	10 4 5 6	10 9 10 0	9 6 9 6
7,200 ..	5,600 ..	6,600 ..	7,000 ..	8,000 ..	8,000 ..
14·0 ..	12·5 ..	13·8 ..	13·5 ..	14·0 ..	13·8 ..
600	1,700	1,350	1,600	1,200	1,200
1,700	4,300	4,700	4,000	5,700	4,200
8 18 ton M.L. 3 12½ ton M.L. 2 6½ ton M.L.	4 25 ton M.L.	4 35 ton M.L.	4 35 ton M.L.	4 38 ton M.L.	4 80 ton M.L.
16 24 prs. Howitzers.	Boat and Field Guns only.				8 20 prs.
410	548	714	714	820	1,700
70	85	140	140	130	450
560	355	515	515	525	820
22	..	..	..	..	..
13 6	14 9	14 3	15 6	15 6	13 6
Whole length.	Whole length.	Whole length.	Whole length.	Whole length.	110
9 ..	12 3	12 3	12 3	14 3	24 3
..	415	556	600	680	970
1,800	2,700	2,900	3,330	3,690	3,540
† Displacement, as completed, about 9,300 tons, including 460 tons of ballast.		Superstructures and armoured bulkheads were added during construction. See also page 8 of 'Transactions,' I.N.A., for 1873.	Work stopped early in 1871, and design cancelled.		Figures above relate to armament actually carried. Lighter turret guns were originally proposed.

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PARTICULARS OF BRITISH AND

	COLLINGWOOD.		CAMPERDOWN and ANSON.	
	As designed.	As completed.	As designed.	As completed.
Date of Design	1880.	1886.	1882.	1888.
Name of Designer		Sir NATHANIEL BARNABY.		
Length . . feet	325 0	325 0	330 0	330 0
Breadth . . ,,	68 0	68 0	68 6	68 6
Draught (mean) . . ,,	25 9	26 4	26 9	28 0
Displacement . . tons	9,200	9,500	10,025	10,650
Freeboard . . Forward . . feet	12 6	11 11	11 6	10 3
Freeboard . . Aft . . ,,	11 6	10 11	11 6	10 3
I.H.P. . . Natural draught . .	7,000	..	..	..
I.H.P. . . Forced ,, . .	..	9,500	9,500	11,000
Speed . . Natural draught . knots	15.0	..	..	..
Speed . . Forced ,, ,,	..	16·5	16·0	16·8
Coals carried at the designed load draught . . . . . tons	950	900	900	900
Coal endurance at 10 knots . . . knots	7,300	7,000	..	6,000
Armament . . Main	4 43 ton B.L.	4 45 ton B.L.	4 63 ton B.L.	4 67 ton B.L.
Armament . . Auxiliary . . .	6 6 in. B.L.	6 6 in. B.L. 12 6 prs. Q.F.	6 6 in. B.L.	6 6 in. B.L. 19 6 prs. Q.F. 3 prs. Q.F.
Weight of Projectile (heaviest) . . lbs.	714	714	1,250	1,250
Weight of Charge . . . . ,,	315	295	520	630
Total Weight of Armament . . tons	660	760	960	1,070
Weight of Auxiliary Armament . . ,,	120	200	160	200
Height of centre of metal of heavy guns above designed water-line . . feet	21 6	20 11	21 0	19 9
Length of Belt . . . . . ,,	140 0	140 0	150 0	150 0
Greatest thickness Side armour inches	18	18	18	18
Greatest thickness Protective Deck ,,	2½	2½	3	3
Weight of Horizontal Armour Deck, Glacis Plates, &c. . . . . tons	905	940	1,140	1,210
Total weight of Armour and Backing, including Protective Deck . ,,	2,730	2,780	3,150	3,130
	See Parliamentary Paper, No. 222, of 1887.		See Parliamentary Paper, No. 237, of 1888.	

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FOREIGN BATTLE SHIPS—*continued.*

SACHSEN.	DUILIO.	AMIRAL DUPERRE.	MAGENTA Class.	ITALIA and LEPANTO.	SINOPE Class.
1877.	**1878.**	**1876.**	**1881.**	**1877.**	**1883.**
German.	Italian.	French.	French.	Italian.	Russian.
298 0	332 0	311 0	323 0	400 6	300 0
60 0	64 2	66 11	65 7	72 9	69 0
19 8*	26 7*	26 9*	27 3*	31 3*	26 0*
7,400	11,138	11,100	10,580	13,900	10,800
..	..	..	..	..	..
..	..	..	..	..	..
5,600	10,000	5,780	7,000	18,000	..
..	..	8,000	..	..	13,000
14·0	15·0	..	..	..	..
..	..	14·2	15·9	16·0	16·8
700†	1,279†	..	600	1,650†	886†
Not known accurately.					
6 15 ton B.L.	4 100 ton M.L.	4 47 ton B.L.	4 52 ton B.L.	4 100 ton B.L.	6 50 ton B.L.
4 15 prs.	{1 33 pr. 4 3 in. B.L.}	{1 6 in. B.L. 14 5½ in. B.L.}	17 5½ in. B.L.	8 6 in. B.L.	7 6 in. B.L.
412	2,002	926	926	2,002	732
126	507	258	357	661	247
..	..	..	..	..	..
..	..	..	..	..	..
..	..	..	..	..	..
..	..	..	..	..	..
16	21½	21½	18	..	16
..	..	3	3	3½	3
..	..	..	..	..	..
..	..	..	..	..	..

NOTE.—These particulars are chiefly taken from Lord Brassey's *Annual.*

* These are extreme draughts.

† These are believed to represent the bunker capacity, and not the amounts carried on the draughts given.

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Admiralty Office—an experience extending over twenty-two years—when the members of that staff included so many thoroughly educated, capable, and qualified naval architects and marine engineers as are now serving there. The great system of technical education, established by the Admiralty twenty-five years ago, largely in consequence of the recommendations of this Institution, has borne good fruit, and the Public Service is reaping the benefit, not merely at the Admiralty, but in the Dockyards, while, outside the service, men similarly trained have risen to the highest professional eminence.

"If with such a staff, with all our recorded data and experience, with our grand experimental establishment at Haslar, so ably conducted by my friend, Mr. Froude, and with all the valuable assistance and suggestions coming to us from the Naval Service, and our professional colleagues in the Dockyards, as well as the constant benefits we derive from a full knowledge of the work done by private shipbuilders and foreign competitors, we do not, in the 'Whitehall Office,' succeed in producing 'the best possible ships' consistent with the instructions of the Board of Admiralty, then there can be no excuse. But I contend that the allegations made against the professional officers of the Admiralty have been loosely made, and are proved to be unfounded, as regards the designs of the new battleships, by the facts which have been adduced.

"A much more important question than that of our professional competency arises from the discussion; and public interest must chiefly centre in it, since it seriously affects the national defence. Assuming that we have done the best that could be done under instructions received from the Board of Admiralty, the country desires to know whether the ships proposed to be built are 'the best possible ships' which can be added to the Navy under existing conditions of naval warfare.

"On this question I shall not be expected to give an opinion. It involves an inquiry into the competency of the Board of Admiralty and our system of naval administration. But at the risk of repeating statements already made, I must say that there never have been designs more deliberately and carefully considered. The selection was made from amongst a large number of alternative designs, after a careful review of what is being done abroad, and with reference to various proposals not yet embodied in actual ships. Fortunately, it could be based upon a great mass of new experimental data, obtained by actual trials against the Resistance and elsewhere, and giving the latest and best information in relation to guns, projectiles, explosives, and armour. Moreover, the Board of Admiralty has availed itself of

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the advice and assistance of a number of distinguished officers before coming to a decision.

"A complete account of the action taken, and the reasons for the various conclusions reached, has been placed before the public. Obviously there is room for differences of opinion, since actual experience in naval warfare under modern conditions is almost entirely wanting. The matter, therefore, resolves itself into one of *relative authority and experimental information.* Under these circumstances, the Naval Service and the country will probably prefer to accept the conclusions of a responsible and well-informed body like the Board of Admiralty, rather than those of any individual."

Discussion on paper. Sir E. J. Reed's speech: *Times'* report.

Sir E. J. Reed, M.P., said Mr. White's concluding remarks had gone very far in his judgment to explain the harder and harsher parts of his (the speaker's) criticisms. He would like at the outset, in order to relieve the debate as far as possible from personal feelings, to say that it had been with immense regret that he had had to cast antagonistic reflections upon fellow professional men, were it not that he was encouraged by a knowledge of the fact that if he had not been doing so for a long series of years the country would have had very different ships built for the Navy from those now before the Institution. He would like to explain that, although Mr. White had been courteous enough to furnish him with a copy of his paper as early as possible, it had only reached his office in the middle of the day previous, and had not come into his hands until the evening at the House of Commons, and until that morning he had been unable to read a line of it. He took no objection to any part of Mr. White's paper, or to the tone in which it was couched. Mr. White had been fair and moderate, considering the nature of the attacks to which he (the speaker) had more or less subjected him, and he was glad to know that Mr. White had not made the present the occasion of aggravating any differences which existed between them upon those matters. The first point he would like to refer to was that there was some mystery which nothing that had been said in the Parliamentary papers, or in Mr. White's paper, had cleared up—a mystery attaching to the part that naval officers outside the Admiralty had taken in connexion with this business. Mr. White's own statements were rather peculiar. He said: "The choice eventually made by the Board was made from among a considerable number of alternative designs, and before coming to the design the First Lord convened a meeting." There were gallant gentleman present who would be able to put the matter right later on, but as he had read the papers, the course taken was that the naval gentlemen with whom the Admiralty

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Sir E. J. Reed.

took counsel at Devonport were consulted as to certain matters, of which the first was the nature of the armament and its disposition and placing. He, for one, closed at once with the doctrine that, in building a first-class battle-ship for this country, armament considerations ought to take a first place. The first consideration in building such vessels should be to keep them afloat in the face of any fire which might be brought against them, and they should be of such construction that the small armaments of the enemy should never be able to destroy them. That had been the ground of the whole of his public agitation against such ships. He raised the point because it seemed that the question of armament was given the first place in the deliberations of the naval officers, and none of the papers said whether it was so, or what the naval officers wished to be done. All he knew was that they decided on what the disposition of the armament should be, and that was made a matter for primary consideration. His objection to the new battle-ship, and the reason he denounced it as an abuse of naval construction, was that it carried such an enormous weight, and cost such immense sums of money for armour plating, which at the same time added nothing whatever to save the ship when in danger of being injured by heavy fire. He referred to the redoubts designed by Mr. White, which gave next to no advantage in the way of protecting the ship when in battle, and said he would do nothing which would sanction the application of the public money, and the risking of the lives of the officers and men, in connection with ships which were not provided with the fundamental quality of being able to keep afloat. Mr. White had utilised in his paper a good many circumstances which were open to him to avail himself of, but he could not allow Mr. White all the advantages which he claimed. In the case of the Nile and Trafalgar, Parliament had had put before it a design for a ship of 12,000 tons, to conform to certain conditions and to accomplish certain objects. Before the matter was discussed, however, the Nile and Trafalgar had undergone a change. He made his comparison of the new ships with the Nile as she was designed, and objected altogether to having her brought forward as she was in her altered condition. This brought him to a condemnation of the narrow belt. The Nile and Trafalgar had been overburdened in the course of construction by 500 tons or thereabouts, but as fighting ships no officer or man need hesitate, any more than if the ships had been built as designed, to go with them into battle. On the contrary, the Nile and Trafalgar, as now constructed, were in reality better fighting ships than they were before. He did not for a single moment wish to call into question

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Sir E. J. Reed.

the qualifications, views, or principles of Mr. White and his predecessors. He had not the slightest doubt that if Mr. White was obliged to stand idly by and take all the guns and other conditions which the Board of Admiralty imposed upon him—for he noticed that Mr. White frequently retreated behind the name of "the Board"—if he did that, it was not to be doubted Mr. White had worked out the design perfectly well, as he was capable of doing. But the reason he was rather disposed to visit those designs upon the constructor was this—that whenever he saw a new ship laid down, and noticed in the *Times*, he found that it was invariably "designed by Mr. White." Therefore, as Mr. White stood before the world as the responsible designer, and as they knew nothing of what amount of pressure had been put upon him, they were obliged to hold him responsible for that to which his name was affixed. If, then, Mr. White put the position of large auxiliary armament before the provision of the flotation and stability of the ship, he disagreed with him absolutely, and should oppose him to the utmost of his ability. The First Lord of the Admiralty, in his speech before Parliament, stated that the new ships, as regarded their armour defence, were ships more of the Nile and Trafalgar type than of the Admiral class. He admitted that Mr. White got some advantage from his 5-in. armour. But no importance was to be attached to that, for the reason that perhaps there was not a man in the room who could doubt that the enemy would knock to pieces that 5-in. armour with his larger guns. As soon as that was done the ship actually became of the Admiral type rather than the Nile and Trafalgar type. The distinction was that in the Nile type the armour came up to the deck above the water, and in the other type it did not. Therefore he found that the First Lord of the Admiralty would have been under a total misapprehension as to the nature of the ship's armour if he himself had not been in the House to stop and correct him (laughter), and make the House of Commons understand that the armour of those ships was disposed after the fashion of the Nile and Trafalgar. Mr. White had asked at one point of his paper at what period the Admiralty Office decadence began. (Mr. White:—"Hear, hear.") It began when the Admiralty turned out the Inflexible. When the Conservative Government took office in 1885, he himself went down to the Admiralty to see a distinguished naval officer, who then occupied a high position of responsibility, and inquired what was to be the policy of the new Board. The officer informed him that the policy was to have no more ships of the Admiral class, or anything approaching to it; they would have "the Dreadnought brought up

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Sir E. J. Reed.

to date." There was a point in the argument of Mr. White to which he attached some importance. Mr. White pointed out that when the redoubts were of the kind used in the new barbette ship the projectile could not easily get into them. He understood that what was said in the House of Commons was that unless the actual redoubt was penetrated it was impossible to injure the machinery or the guns, whereas if it were in a larger redoubt a shell might enter the more readily. But were they to be told that they could therefore take away 16 in. of armour and put on 5 in. of light armour, which would let an enemy's shell into the interior? Mr. White had pointed out that an essential difference between that new barbette type and the Admiral type was that the armour had a certain extra percentage in length. He (the speaker) had not said that those ships were so deficient of armour as the Admiral type was. He had acknowledged that the belt was larger and about 1 in. higher, and he did not say that those vessels were so liable to such disastrous results as vessels of the Admiral class. He could not for a moment assent to Mr. White's view that it was better to bring the main armour down near the water surface and put 5 in. above it rather than to carry the solid armour up to a much more reasonable height. Mr. White had referred to the coal protection of certain vessels, but if any one was a regular reader of the *Times*, and had happened to look at the naval intelligence lately, he would have seen a remarkable instance of the utility of coal protection. The Orlando had had the misfortune to have all her armour disappear under water. She was given some coal protection, the result being that so much additional work was imposed on the men that the stokers had to leave the stokeholds, and the seamen had to go below to assist. He was, therefore, rather surprised that any officer of the Admiralty should refer to that subject. On the question of speed, Mr. White had not made himself at all clear. With regard to the point about speed being cheaply obtained, the form which Mr. White's criticism took coincided with the idea he himself wished to express. When he began to deal with ironclads, if they wanted an engine of 4000 horse-power, they would require about 750 tons of weight to get it; whereas they were able now with a given weight to get more than double the power. Therefore they got power now more cheaply than in those days.

Mr. White said the remark made was that speed was cheaply obtained, not power.

Sir E. J. Reed said to his mind the terms were synonymous for the purposes of argument. (Laughter.) If power was not cheaply obtained and speed with it, how did it happen that in the Blake and

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the Blenheim they had 20,000 indicated horse-power? Therefore, was he not justified in saying that with a ship of 9000 tons they could carry machinery and have 20,000 horse-power? He need not say how sorry he was to have to take up his present attitude with regard to Mr. White. He had no question in his own mind as to his perfect competency to work out a design and have it carried through. That was not the sort of thing he referred to when he spoke of "incompetence." Owing to the force of circumstances and divided responsibility, they did not get the best out of any particular man, whether naval officer or naval architect. And one good result of denouncing the Admiralty for incompetence was that a great deal more had been made known about those matters than otherwise would have been known. His sole desire was to see the Navy of this country and every ship belonging to it as strong and as safe as it could possibly be. (Hear, hear.) Sir E. J. Reed.

Lord Armstrong remarked that it must be quite clear to all that the ship designer must make, in the ship for the immediate future, a vessel which was a compromise, and in the ship of the new barbette class we had the best compromise, as it appeared to him, between the offensive and defensive principle. (Hear, hear.) Sir Edward Reed seemed to maintain that the defensive powers of a ship could be completely established, but this could only be done by the elimination of her powers of offence. What had been heard that afternoon only increased the disfavour with which he viewed the armoured class. They could not be made invulnerable, and their cost was so enormous that we could not have a numerous Navy with such vessels. Our Navy should consist of a great number of ships, and to secure this we had to restrict the number of the most costly ships. Lord Armstrong.

Lord Charles Beresford, M.P., who was received with applause, remarked that the question raised before the meeting was "armour or armament." As a seaman, he should like to give his views as to a fighting ship. He thought Sir Edward Reed was wrong as to the new ships. As to the 5 in. of armour, it was to be remembered that it was not the effects of heavy shot that the vessel would have to fear so much as shell, and the 5 in. of steel would explode a shell or high explosive. (Sir Edward Reed:—Would not 16 in. of iron do that?) Yes, but in order to have the armour the ship would have to sacrifice the coal, or do away with the auxiliary armament—and upon this auxiliary armament the naval officers laid great stress. (Cheers.) The naval officers wanted, above all, offensive qualities in the ship—they wanted the defensive part as much as possible; but they did not want, for the sake of that, to do away with that offensive Lord Charles Beresford.

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power by which they could knock the enemy into a cocked hat. (Laughter.) Naval officers did not want to say to the enemy "You can't hurt us:" but they wanted to say "We can hurt you," and that was the point before the country. (Loud cheers.) As to the armour, he thought the Board of Admiralty had been wise in adopting the compromise shown in this class of ship. As to Sir Edward Reed's assertion that foreign Governments were in a state of trepidation about the narrow belts, all he could say was that he had been abroad and had not noticed this trepidation. And if it existed, why on earth were foreign Governments going on building ships with these narrow belts? He defied Sir Edward Reed to name a ship being built abroad with a broader belt, and, in fact, ships were being built with narrower belts.

Sir Geoffrey Hornby.

Admiral Sir Geoffrey Hornby said he did not feel competent to criticise the design of a ship on paper; but as a naval officer he desired to press for ships of great offensive power and of great speed; for it was speed that enabled them, on meeting an enemy, to prescribe the manœuvre. They could not hope to use ships of great power if they did not have speed. In order to get concentrated power and power of manœuvre and speed, they must give up the great weight of armour or else have bigger ships.

Sir N. Barnaby.

Sir N. Barnaby said Lord Charles Beresford had pointed out that the result of firing shot was of less importance than shell or high explosive; but he had himself seen the results of firing shot more, perhaps, than most naval officers, at Shoeburyness, and had had to go behind an armour-plate target to see the results of a shot, and the experience had made him desire to have armour made thicker and thicker. He should like to ask why they were not to get a high explosive through a thicker plate than was being placed on the new ship. The protection said by Sir Edward Reed to be necessary for the Admiral class was obtained with the new barbette ship at an enormous cost, the armour alone for one ship being equal in cost to the cost of the whole Natural History Museum at South Kensington. He could not understand the policy which would send, together with the heavy ships, light ships unprotected into action. He considered the Admiralty to be wasting the national resources upon armour piled up in a few ships.

Captain Fitzgerald.

Captain Penrose Fitzgerald, R.N., said he felt somewhat shy of speaking before his naval superiors, and also of criticising naval architects. He had got into hot water lately in this matter, in which there had been some hard hitting. He liked hard hitting, but he had no respect for those who liked to hit hard and did not like being

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hit back. (Laughter.) He should like to know from Mr. White, whether, if strong things were said of his designs, whether an appeal would be made to the law. (Renewed laughter.) He did not know that Sir Edward Reed could be held to be a better judge of what a fighting ship should be than those who risked life and honour on the ship. Sir Edward Reed had drawn a terrible picture of disaster to a ship, but if the seamen preferred to take the risk in the ship, let them take it together with the fighting power. That was their affair. Sir Edward Reed had not to go to sea in the ships. (Cheers.) The argument of those who spoke of the expensiveness of the ships would lead to every naval officer being warned of the value of his ship, and told: "Do not go near the shore, and do not go near the enemy, whatever you do." (Laughter and cheers.)

Admiral Colomb maintained that in designing the first class of war vessels the gun power was the first thing which had to be settled, and everything else depended upon that. He believed in a narrow belt and in a protective deck kept low as the safest way to protect the ship. He said that in former times the victory had generally gone to the ship which could place *hors de combat* the greatest number of her enemy's seamen. The Admiral class exposed the seamen. In the new battle-ships the men were well protected, the coal supply was amply sufficient, and naval opinion was altogether in favour of that class of ship. (Cheers.) Admiral Colomb.

Admiral Lord Clanwilliam wished to add his testimony to the chorus of praise from naval officers on the new class of ship, and his confidence in the designer. Lord Clanwilliam.

Mr. White, in reply, said it was impossible to answer all that had been said in the discussion. It was a matter of immense satisfaction to him to know that he had not, in addressing his paper to that Institute, been appealing, as Sir Edward Reed had put it, to ship-builders, and he did not expect that they would take part in a discussion regarding a fighting ship. (Cheers.) The question of the protection of the auxiliary guns and their crews had been carefully considered and provided for, but those were matters which were not yet public property. He wished it to be perfectly clear that, though he was the designer of the ships, they were the ships of the Board of Admiralty. He did not wish it to be thought that he approved of everything in the ships—to approve of everything in a ship was not his business. (Cheers.) It was his duty to combine in a ship that which the Admiralty, and the Service behind it, wished to be combined in a ship, and that was what he was called upon to put before the Board. (Cheers.) He came there not to justify himself Mr. White's reply.

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(cheers), but to explain what the Board of Admiralty intended, and what was hoped to be achieved by these ships. He then went, in detail, over some of the criticisms. In conclusion, he expressed the hope that the facts which had been brought forward, and the discussion which had been initiated in that Institution, would satisfy the public on the point that no pains had been spared to produce the most powerful war-ships which the Admiralty had ever launched. (Cheers.)

IV.

The conclusions which the majority of unprejudiced minds will be disposed to draw from a consideration of the arguments brought forward are embodied in a *Times* leader reviewing the proceedings at the Institution of Naval Architects :—

The *Times* leader on the question of the new designs.

"It was natural and altogether satisfactory that the announcement that Mr. White, the Director of Naval Construction, had obtained the permission of the First Lord of the Admiralty to read a paper before the Institution of Naval Architects on 'The Designs for the New Battle-ships' should attract a large, attentive and influential audience to the meeting of the Institution held yesterday at the Society of Arts. The occasion was no ordinary one. The country is about to embark on a new programme of naval construction, calculated, in the judgment of the Admiralty, to add largely to the strength and efficiency of the Navy. In pursuance of this programme ten battle-ships are to be forthwith built, eight of them of larger dimensions than any war-ship now in existence. The designs of these eight battle-ships are in essential features identical. They stand or fall together. Whatever adverse criticism applies to the essential features in the design will apply equally to all the eight ships when they are built. The country is therefore indebted to Sir Edward Reed for assuming the invidious but useful part of a critic of this design, as he has done both in Parliament and in our columns, and as he did again yesterday at the meeting of the Institution. If he is right, the ships ought not to be built. If he is wrong, and can be shown to be wrong, the confidence both of the naval service and of the country at large in the ships about to be built will be established and strengthened. It was on this issue that Mr. White, who is officially responsible for the new designs, directly encountered Sir Edward Reed yesterday. His paper, as will be seen from our report, was a lucid exposition of the leading features of the new designs, and a detailed examination of the criticisms levelled at them by Sir Edward Reed. Sir Edward Reed himself took the lead in the

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animated discussion which followed the reading of the paper. He remained unconvinced by the arguments of Mr. White and others; and, while adroitly ignoring several shrewd thrusts of his opponent, and gliding evasively over a variety of points in which he was proved to be wrong, he stoutly maintained his position that the deficiency of armoured protection in the new design would render the new ships so unsafe that they ought not to be built. In this he found no support from subsequent speakers. Lord Amstrong tersely and emphatically expressed his dissent. Admiral Hornby, Lord Charles Beresford, Admiral Colomb, Captain Penrose Fitzgerald, and other naval officers of experience and distinction, one and all repudiated from various points of view the theory of battle-ship construction to which Sir Edward Reed so gallantly nailed his flag; while Sir Nathaniel Barnaby, who severely criticized the new designs on some points, did so mainly on the ground, not that the armoured protection was deficient, but that it was redundant.

The *Times* leader.

"If authority and opinion, expert and professional, could decide the matter, the public, which for the most part has little else to go upon, will certainly be apt to think that there can be nothing very formidable in Sir Edward Reed's criticisms after such a discussion as that of yesterday. Sir Edward Reed's own authority is deservedly weighty; but he is not infallible, and yesterday he was plainly overmatched. It is, moreover, not altogether unfair that his credentials should be examined, even if some people are tempted to examine them in the trenchant manner adopted by Captain Penrose Fitzgerald in a letter addressed to ourselves. Sir Edward Reed is himself a formidable antagonist; he is given to plain speaking and hard hitting, and he does not shrink from personal criticism. It is to be regretted, therefore, that when he is encountered with weapons not altogether unlike those he has been known to use himself, he should hasten to transfer the controversy from Parliament and the Press, where he is perfectly well able to take care of himself, to another tribunal. But we need not pursue the subject in this direction. The broad issue of the controversy waged yesterday before the Institution of Naval Architects is, fortunately, one which it does not require much technical knowledge to appreciate. A battle-ship is a compromise. Every design is rather the result of a conflict of divergent opinions, and of more or less incompatible aims than the integration of ascertained and indisputable facts. Different authorities, all equally competent, will attach varying importance to the several potentialities, all more or less indeterminate, of offensive and defensive efficiency, which the naval constructor attempts to combine

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The *Times* leader.

in a battle-ship. Sir Edward Reed lays down one fundamental condition which he regards as paramount to all the others. The first consideration, he affirms, in building first-class battle-ships should be to keep them afloat in the face of any fire which might be brought against them, and they should be of such construction that the small armaments of the enemy should never be able to destroy them. This is the theory of battle-ship construction which Mr. White characterizes very aptly as one which seems to regard the ships as built chiefly with a view to make them "efficient locomotive floating targets, capable of withstanding the effects of gun-fire, and not capable of inflicting as well as receiving damage." If the armour of a battle-ship could be extended so as to fulfil Sir Edward Reed's condition without fatally impairing her offensive efficiency in other important, not to say vital, respects, all would be well. Sir Edward Reed confidently asserts that it can. But he certainly failed yesterday, and, so far as we know, he has never seriously attempted, to show how. Given a certain displacement, and a certain draught, the variable elements are, roughly speaking, the weight of armour, the weight of guns and ammunition, the weight of stores, including coal, and the weight of the engines, on which the speed of the ship more or less directly depends. Now, it requires nothing more than common sense to perceive that if one of these elements—namely, the weight of armour—is increased so as to afford the protection regarded by Sir Edward Reed as indispensable, some other element must be proportionately diminished in weight. Hence we come back to the question of compromise. Is the condition insisted on as paramount by Sir Edward Reed really entitled to be so regarded? We cannot do better than refer to Mr. White's paper for an answer. "In the recent battle-ships of nearly all foreign navies belts of thick armour as narrow as, or narrower than, those condemned by Sir Edward Reed have been and are being adopted." Here we have a concensus of opinion among naval constructors. As for the professional opinion of naval officers, we may appeal to that of the speakers at yesterday's meeting, as well as to the history of the new designs as recorded in the Parliamentary paper entitled "Action taken by the Board of Admiralty with regard to the preparation of designs for first-class battle-ships." Can it be, then, that Sir Edward Reed is right and every one else wrong? We doubt if any one who reads the original attack of Sir Edward Reed side by side with Mr. White's masterly, and in many respects unanswered, reply will come to this conclusion.

"The truth is that Sir Edward Reed has totally overlooked or

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ignored two important points, one of which depends upon the other. The first of these is the growing importance, on which Mr. White so effectively dwelt, of the auxiliary armament of battle-ships. The second, which depends on this, is the desire of naval officers—a very natural and laudable desire—for a *maximum* of offensive power. In fact, the whole question, as Lord Charles Beresford put it with sailor-like directness, is one of "armour or armament." Increase of armour means decrease of armament; increase of armament means decrease of armour. Sir Edward Reed concentrates his attention on the protection of the ship against destruction in one particular manner. The naval officer very properly concentrates his attention on the destruction of the enemy's ship by any means in his power. The latter believes that he can either destroy his enemy or compel him to surrender by the effective use of his auxiliary armament, supplementing the slower but in certain contingencies more destructive use of his heavy armour-piercing guns; and the judicious naval constructor meets his demands by giving him an auxiliary armament practically equal in weight, as Mr. White points out, to the total weight of armament proposed for the Fury, which was designed by Sir Edward Reed in 1870, and completed by Sir Nathaniel Barnaby as the Dreadnought. You shall have no such auxiliary armament, says Sir Edward Reed in effect, because if you do your armoured protection must be so much reduced as to render your ship liable to destruction by the auxiliary armament of the enemy. In other words, in order to secure redundant protection against only one of the contingencies of a naval engagement, the offensive efficiency of the ship is fatally crippled, and many other contingencies equally probable and quite as serious are still left unprovided for. The danger on which Sir Edward Reed concentrates his whole attention is hardly at its worst greater than the danger of destruction by a torpedo, or of the penetration of the ship by a shell below the armoured belt. But these dangers must be encountered, even on Sir Edward Reed's principles, and the naval officer will take them and others as part of the day's work and the day's risk if he finds himself provided with a ship designed according to his requirements. In fine, Sir Edward Reed's ideal seems to be a battle-ship in which the offensive powers are reduced to a *minimum* by the development of one particular element of defensive power to a *maximum*. That is not the kind of ship which would satisfy British officers, nor, unless we are very much mistaken, is it the kind of ship in which the country is prepared to send its men to sea."

The *Times* leader.

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V.

Observations of the compiler on Mr. White's paper.

The first consideration in building ships should be to keep them afloat in the face of any fire which might be brought against them; and they should be of such construction that the small armaments of the enemy should never be able to destroy them. That had been the ground of the whole of his public agitation against such ships. He revived the point because it seemed that the question of armament was given the first place in the deliberations of the naval officer.

Armour *versus* armament.

In effect, as Lord Charles Beresford concisely stated it, the question that was before the meeting was that of armour *versus* armament. If Sir Edward Reed could by an increased weight of armour guarantee immunity from destruction, it might be worth while to make a sacrifice in the offensive power; but no such immunity can be given. Armour affords protection only against the gun; it gives no defence against the not less formidable risks of injury from the torpedo, the ram, or the manifold perils of navigation. Sir Edward Reed contends that without increasing the weight of armour a better defence might be obtained by a different distribution of armour. He advocates the removal of the armour now used for protection internally, and the placing of it upon the sides in wake of the battery and round the water line. If a design embodying these views were submitted to criticism, weak points would probably be shown. This at least is certain, that in the French ships with all-round belts, the weakness resulting from the absence of a stoutly plated athwartship bulkhead forward, giving protection from a raking fire, needs no demonstration. The present writer has devoted no inconsiderable amount of time and attention to a comparison of the various methods of protection adopted in our own and foreign navies. The study of the subject has been singularly barren of conclusions. It is certain that there is no absolute best. Every design is a compromise, and falls short of ideal perfection. Under no system can anything more be obtained by the use of armour than a partial defence from injury by the gun. It is presumptuous to differ from the general opinion of the naval profession, but in the admitted necessity of having to make a choice between protection of the water line and protection of the men at quarters, it seems open to question whether the latter should not claim the first consideration. That ships would be riddled in action in their upper works in a close action is certain. That they would be struck at the water line is doubtful. There are means of protection other than armour for the water line. There is no means

Armour a partial defence from injury of the gun.

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of protection other than armour for the men at the guns. Wholesale destruction of life is as certain to lead to capture and defeat as injury to the hull and machinery.

The Government may justly plead that in the preparation of the new designs they have been guided by the advice of those who should be most consulted. They have called in council the gallant officers whose duty it would be to fight their country's battles on the sea. In the execution of the designs the responsibility must rest with the Constructors of the Admiralty. None abler than those now serving have ever been employed in the department.

It is not for civilians and laymen to guide the policy of the country in a technical matter. If I may offer any words of criticism, they shall be directed, not to what is included, but to what is omitted from the programme. I would urge that the provision for the necessary auxiliaries of the great battle-ships is inadequate. The powers of our floating fortresses would be developed out of all proportion to the increased cost, by grouping around them those armoured rams so strongly recommended by the naval officers of the United States, who have had the most experience of naval warfare since the introduction of steam. It would seem desirable to multiply in much greater numbers than is at present proposed those sea-going torpedo vessels which are equally valuable for defence and for attack.

Armoured rams omitted from the new programme.

There may be some who find it difficult not to follow Lord Armstrong in the disfavour with which he views the armoured class. They cannot, he urges, be made invulnerable. Their cost is enormous. This much, at least, is certain, that it cannot be satisfactory to commit our fortunes in the great perils of an action at sea to squadrons consisting of a few large and powerful but most vulnerable ships. Our Navy should consist of many ships. Excess of cost compels undue restriction of numbers.

VI.

SPEECH DELIVERED BY COMPILER IN THE HOUSE OF LORDS ON THE SECOND READING OF THE NAVAL DEFENCE BILL ON THE 27TH OF MAY, 1889.

"My Lords, I am unwilling to allow this debate to close without expressing my great satisfaction that the proposals for which the Bill makes provision have been brought forward by the Government. Viewed in the light of the experience gained in the interesting Naval

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What the recent Naval Manœuvres proved.

Manœuvres of last year, it is certain that our naval position is not sufficiently assured. It is difficult to fix the standard of strength for the British Navy upon a satisfactory basis. The First Lord of the Admiralty has laid it down that we ought to be equal or superior to any two Powers. Looking to the amount of our mercantile tonnage, looking to the interests we have at stake as a Colonial Power, we should scarcely be aiming too high if we resolved to maintain our strength and our rate of progress and construction at double those of the next strongest Navy to our own. If this were our settled policy it would tend to discourage, rather than to stimulate, a rivalry in expenditure. There are indications that such a result might be anticipated in the Estimates recently brought forward for the year 1890 by a neighbouring Power. Passing from the amount of construction proposed in the new programme to the designs, I think that the Government have pursued a course which must command general approval. They have consulted not only the able Naval officers now serving at Whitehall, but the officers outside the department who have had the most recent experience in the command of fleets. As their chief professional adviser they have in Mr. White a naval architect of the highest ability. I will not trouble the House with criticisms of designs which have been matured by able experts. As the compiler of a naval annual, I have had frequent occasion to study and compare the designs of ships, British and foreign. I have seen no design in any class which could be accepted as perfect. Every ship of war is a compromise. A gain in offensive or defensive power is inevitably balanced by a loss in manœuvring qualities. In a large navy you must have all types represented. If you build big ships, you must group nimble auxiliaries around them. The first-class battle-ships you are about to lay down will cost £1,000,000 sterling. They represent the most effective combination of power which the ingenuity and skill of the present day can contrive; but they are not invulnerable. A squadron of such ships blockading an enemy's ports full of torpedo boats would be in a position of great peril in darkness and in fog. For the protection of those great floating fortresses we must build sea-keeping torpedo vessels in numbers largely in excess of the present proposals. In a naval action armoured rams would give invaluable support to large ships. In the smoke and confusion the guns of the heavy ships would tend to become less reliable weapons, and the chances of dealing a fatal blow with the ram and torpedo would be greater. These considerations will, I think, impress every thoughtful naval administrator with the conviction that the programme of construction now pro-

Standard of strength for the Navy.

The designs of the new ships.

In a large navy all types of ships must be represented.

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posed, necessary as it is and bearing every mark of ingenious and able design, will by no means supply all that is needed to complete the Navy. A large flotilla of sea-keeping torpedo vessels and numerous armoured rams are indispensable auxiliaries, and it should be the duty of those who take an interest in the Navy to press for the construction of those auxiliaries in future years. Cruisers are absolutely necessary, and the new programme, I am glad to see, will give us a strong reinforcement of fast and efficient vessels."

What ships must be provided in addition to those named in new programme.

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CHAPTER VIII.

DOCKYARDS.
THE ROYAL CORPS OF CONSTRUCTORS.
DOCKYARD MANAGEMENT.

Practical results depend mainly on local officials.

WE now pass to the administration of the dockyards. The efficiency of these great and costly establishments essentially depends on the local management. Parliament may push inquiry. The central authority may issue volumes of regulations. The practical results are small in comparison with that of the work of local officials. For many years after the abolition by Sir James Graham of the office of Commissioner, the great responsibility which attaches to the civil management of the dockyards had not been sufficiently recognised either in pay or status. The scheme adopted by Lord Northbrook's Board, with the view to improve the position of the professional officers, was thus described by Mr. White in his evidence before the House of Commons Committee of 1888:—

Mr. White's evidence.

"He was *ex officio* the head of the Royal Corps of Naval Constructors. That body had been created by an Order in Council of August, 1883, mainly owing to Admiral Sir Houston Stewart. Its establishment had been most advantageous. It had kept in the service a number of able young men who would have gone out of it; it had enlarged our sources of supply without barring the chance of any boy or man in the yards; and, although it had not as yet operated to get men from outside, it left the door open. They must not talk of getting able men from the outside unless they associated with that proposal a full consideration of how those men were to be paid. Some of the most important shipbuilding work in the dockyards was now being done by the young men who were members of this corps."

Mr. Elgar's evidence.

Mr. Elgar gave important evidence on the same subject. In his view the selection of the members of the new corps for appointments in the dockyards was not altogether satisfactory. The pick of the corps was selected for employment at the Admiralty, while the rank and file, after the best men had been thus eliminated, were sent to the dockyards. As the professional officer chiefly responsible for the

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practical efficiency of the yards, Mr. Elgar asked that he should make the final recommendations to the Controller as to the class of men to be appointed. The request seems reasonable. Mr. Elgar objected to the selection of foremen by competitive examination, rightly insisting that their qualities cannot be tested by paper examinations.

The inspectors.

One recommendation of the Committee on the Corps of Constructors, though strongly pressed by the professional officers, does not appear to have been attended with advantage. It was suggested that the authority of the leading men, who practically act as foremen over their gangs, would be strengthened if they were designated inspectors, and transferred from the weekly pay-sheets to the salaried list. As a result the increased charge for pay and pension has not been followed by corresponding increase of energy or strengthening of authority.

Want of stimulus.

Where there is no stimulus of pecuniary reward, and nothing in prospect to gratify ambition, it is not easy to sharpen the supervision of dockyard labour, or to correct the tendency on the part of the professional officers to stick to their desks, and thus to neglect the more important duty of looking after work at the ship's side. The Treasury is apprehensive that any relaxation of the rules which regulate pay would lead to abuses. Where promotion is the only reward for exertion, and it has been long delayed, it is no longer appreciated as a reward.

Piece-work.

Similar causes operate disadvantageously with the workmen in the yards. Piece-work is the means by which the private shipbuilder ensures diligence. The dockyards are hampered by red-tape and routine. They are liable to sudden and frequent demands for repairs. Much necessary repair and alteration, and much also that is not necessary, are done. A large proportion of the work of the dockyards is of a kind in which perfection of workmanship is of the highest importance. It is perhaps inevitable that a comparatively limited amount of labour is paid for by the piece; but if labour is paid by time the sole reliance must be placed on supervision.

Cost of work in our foreign yards.

Our dockyards abroad have always compared favourably with those at home in the cost of repairs, mainly perhaps because they have had to deal with fewer alterations. The dockyards abroad would show a still better result if the number of English workmen could be reduced. An effort in this direction is particularly called for in the large dockyard at Bermuda. Workmen should be recruited more largely from Malta and Hong Kong.

Bermuda.

In connection with our home dockyards, a decision must shortly

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Haulbowline.

be taken as to Haulbowline. The noble dock and basin, now nearly completed, will not be available for the service of the fleet or for the repair of merchant ships, unless shops and tools are provided.

Good work done by the present Admiralty administration.

While there is room for improvement, all the evidence which has been collected gives ground for confidence that the administration of the civil department of the Navy has become more efficient. Ships are built more rapidly. Due regard being had to the difficult condition of a public administration, the cost compares not unfavourably with the price of contract work. The designs for ships prepared under the able direction of Mr. White will challenge comparison with the best contemporary productions of foreign navies. In that most important means to economy which consists in spending liberally on services which give strength to the Navy, and in cutting down expenditure on less important services, we are making progress, and are certainly doing better than our neighbours. It was pointed out by M. de Lanessau, in the debates on the French Navy Estimates, that in 1887, with a total expenditure of £8,000,000 on the Navy, £2,960,000 was appropriated to shipbuilding. In 1888 the total expenditure was £7,920,000; the expenditure on shipbuilding was £2,640,000. In 1889 the total estimates amounted to £8,200,000; the expenditure on building being reduced to £2,080,000.

Naval administration in France.

Existing stock of Naval stores.

Descending from general results to particulars, it is satisfactory to know that under the improved arrangements for the British Navy the stores comprise few obsolete items. The amount of stores in hand is becoming less in proportion to the total value passing through the warehouses. Mr. McHardy gave the value of the stores in stock at £1,800,000 in 1889 against £2,564,000 in 1878–9.

To conclude, if we make due allowance for the inherent difficulties of management by a public department, we shall in fairness admit that the public is indebted, and that not lightly, to those charged with the duty of managing the dockyards.

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CHAPTER IX.

Admiralty Office and Accounts.

The year 1888 is notable, in connection with the history of the Navy, for the revival of public interest in the state of our defences by sea and by land.

Royal Commission.

A Royal Commission has been appointed, under Lord Hartington's presidency, to enquire into the administration of the Army and the Navy. A Committee of the Cabinet, over which Lord Salisbury has presided, has been closely engaged in examining the conditions of the defences of the Empire. The vote of £2,600,000 for the Coaling Stations, and the large additional programme of construction which has been submitted to Parliament, are two important results of their deliberations.

New Naval programme.

While the nation is evidently prepared to provide whatever expenditure may be necessary to insure the safety of the empire, a growing determination has been shown to probe to the bottom the charges of mal-administration which, from time immemorial, have been brought against the Admiralty. In the Session of 1888 a Select Committee of the House of Commons was appointed, and all the leading officials of the Admiralty were subjected to a rigorous examination. It is mere justice to say that they passed through the ordeal with credit.

Select Committee.

This brings us to a question always raised when the state of the Navy engages the special attention of the public. If there is anything deficient it is but natural to call in question the ability of civil administrators, and to believe that if distinguished sea-officers, with plenary powers and responsibilities, had presided over the affairs of the Navy, all the mistakes would have been avoided which have occurred under civilian First Lords, dividing their responsibilities with a Board. Let us see what the House of Commons Committee have to say on this point. It is treated fully in their fourth Report. They there quote, and give their sanction to, a passage from a draft report of a Committee of the House of Lords in 1871. "The First Lord was clearly responsible to the Sovereign and to Parliament for all the

Select Committee's opinion.

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Board's measures. In respect both to the authority he exercised and to the responsibility under which he lay, his position was precisely the same as that of the Minister at the head of any other great Department of State, and the responsibility of the subordinate members of the Board did not differ from that of an Under Secretary of State. Like an Under Secretary of State, they would have been open to just reproach if, in matters of the highest importance, they had consented to be parties to measures of which they strongly disapproved, rather than resign their offices; but upon all ordinary questions it was justly held to be their duty, after stating their opinion, to defer to the judgment of their chief. The proper authority of the Minister at the head of the Department was thus maintained, while the necessity imposed upon him of finding officers of good standing to act with him as Naval Lords was a security to the profession, and to the public, that no measures seriously affecting the Navy could be adopted without responsible professional advice."

Further opinion of Select Committee.

In a later paragraph in their Report the House of Commons Committee return to the same subject. "It is," they say, "a very doubtful question whether, the powers of the naval members being thus limited, the title of 'Board' does not tend to mislead the public mind, and introduce some confusion into the administration of the business of the Admiralty. The word 'Board' may suggest the idea of a greater equality of authority and community of action than actually exists, and the advantages of free consultation and discussion among the professional advisers of the Minister might be secured without their formal organisation in a Board. It is, however, very desirable that no change should be made in the status of the naval members of the Board likely to diminish the authority which they now exercise."

Having carefully perused the evidence given to the Committee by the members of the present Board; having read the evidence taken by the House of Lords in 1871; and reviewing the whole matter with the advantage of a personal experience extending over some years, the compiler is brought to the conclusion that organic changes at the Admiralty are undesirable. "That which is best administered is best." More depends on the men than on the system.

Present organisation.

Under the present organisation the First Lord, as the representative of Parliament at the Board, and as responsible to Parliament for the acts of his Department, has powers as ample as he could possess under any arrangement. As a parliamentarian, without professional knowledge, he must depend on his advisers on all technical questions. If they are unanimous, he cannot differ. If they differ, he must

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collate and compare, and must take the responsibility for the decision. Practically, on professional points, the First Sea Lord is the chief adviser of the parliamentary head of the Board. It would certainly be desirable that the First Lord should combine with his parliamentary qualifications the naval knowledge of a sea-officer; but such a combination will rarely, if ever, be found. Under no circumstances would it be possible for the same individual to discharge efficiently the parliamentary duties of a member of the House of Commons and to undertake the exacting administrative responsibilities of the First Sea Lord of the Admiralty.

Another arrangement.

While retaining the present organisation, it seems desirable to give more ample information to Parliament, and to mark more definitely than heretofore the personal responsibility of the professional advisers of the First Lord. With these objects in view, an excellent suggestion has been put forward by Sir Spencer Robinson. The business of the Admiralty divides itself broadly under three heads:—Manning, under the First Sea Lord, Ships, under the Controller, and Finance, under the Financial Secretary. As a foundation for the preparation of the Estimates, each of these high officers should prepare a Report. "These Reports should be in the first instance addressed to the First Lord. They should be discussed with him, they should be amended, if cause were shown; but if the Head of the Department and the First Lord could not agree on such a Report as the one could sign and the other allow to be published, the subordinate must resign and the reasons for the resignation must be made public.

More information should be given to Parliament.

Sir Spencer Robinson's proposal.

Routine of reports.

"With these Reports before him, and guiding him, the First Lord should draw up his own, dwelling on such parts of his parliamentary and political management as he thought fit. The Reports would form a volume, to be presented to Parliament with the Navy Estimates, to which they would form a comprehensive and satisfactory key."

Reports should be presented to Parliament.

Exception was taken by Lord Charles Beresford to the rule laid down by Lord George Hamilton that no member of the Board was to write a paper on any question outside his Department, and circulate it, until it had been submitted to the First Lord. The rule was designed, as Lord George Hamilton stated to the Committee of the House of Commons, to concentrate individual responsibility on the duties assigned to individuals. Whatever be the rule as to an official circulation of papers, it would be impossible to deny to men in a high position in a public department the right to put their views on any subject before their colleagues. When the compiler was summoned to the Admiralty the substance of several chapters which had been prepared for his work on "The British Navy" was put into print

Lord Charles Beresford took exception to the rule.

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and sent round to his colleagues and to the professional officers. The printed memoranda were not official, and no official action was called for, but the compiler had no reason to be disappointed with the practical results.

Admiralty staff.

Passing from the Board to the great administrative machine worked under their directions, an additional infusion of the naval element, such as Sir Geoffrey Hornby has urged, might not only effect an economy in salaries but give increased efficiency at the Admiralty. Of the aggregate expenditure for salaries, £31,000 go to naval officers and £181,000 to civilians. Reforms can only be effected gradually. The officers on the active list in employment at the Admiralty must of necessity be few in number. A long service at Whitehall would not be favourable to efficiency at sea, especially in those duties which belong to the junior ranks of the Navy. Constant changes in the Admiralty staff would be highly inconvenient. Some addition to the naval element from the active list might be made on the lines suggested by Sir Anthony Hoskins, by the appointment to the Naval Intelligence Branch of officers who should act as staff-officers to each of the Naval Lords, and who, when any changes were made at the Board, could give to the new comers the benefit of their knowledge. Such officers would be "the hand and the eye of the Naval Lords." They would assist them in keeping up the communication with the service, which, in consequence of their onerous duties in office, is very defective at present.

Frequent changes undesirable.

Staff officers to Naval Lords.

Accounts.

Financial control.

In the system of financial control at the Admiralty considerable changes have recently been made. In relation to shipbuilding the aim has been:

I. To strengthen the responsibility of the professional officers for the cost of the work executed under their directions.

II. To supply information more promptly as to the cost of work in progress.

Mr. Forwood's explanation.

The reasons for establishing a new officer and an independent staff for the purpose of dealing with the expenditure in the dockyards were ably explained by Mr. Forwood in his evidence before the Committee of the House of Commons on Navy Estimates. In reply to questions put by the Chairman as to the circumstances under which the transfer of the Expense Accounts had taken place, Mr. Forwood stated that, "During the year 1886, the question arose as to an

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alteration being made in the system of the preparation, compilation, and keeping of the Expense Accounts at the different dockyards. The Expense Accounts are the details indicating the quantity of material and value of labour, incident to the building and repairing of ships, and incident to the maintenance of the Naval Dockyard Establishments, and to the various naval services. These accounts had been kept up to a certain time under the Controller of the Navy. They were some years since transferred to the Accountant-General. The different Controllers of the Admiralty, and the different constructive officers at the Dockyards had not found that these accounts were of value to them in regard to keeping a check over the expenditure, and keeping the expenditure within the authorised Estimates. In fact they were always months behind the work, and if a constructive officer wished to see how much material he had worked into a given ship, up to say a previous month or a previous week, so as to be sure that he was not exceeding his estimates, the Expense Accounts as then kept did not afford that information. Therefore the constructive officers were forced into keeping a duplicate set of books themselves, and separate clerical staffs. They actually got writers into their different offices in order to post up the amount of labour and the approximate quantity of materials that they had worked up in the ships, because these Expense Accounts, which ought to have furnished the information, were so much in arrear and were not prepared in a technical or professional way, so that they were thus of very little value to them.

Expense accounts.

Duplicate set of accounts.

Mr. Forwood proceeded to explain the reason of the Navy Expense Accounts being in arrear. They are, he said, of so technical a nature that to be of any value they can really only properly be compiled under the supervision of a man who is himself accustomed to shipbuilding. An ordinary book-keeper sent down to keep the cost accounts of the building of a ship would be quite at fault. Men are required who are familiar with the technical details connected with the building or repair of ships.

Reason why these accounts were in arrears.

Under the new system of accounts the constructive officers supply the Expense Account Officer with details, and inform him under what headings they wish the construction of a ship to be kept. Then, as regards the labour, while the overseers and foremen are furnished with a list of the men under their responsibility, time-keepers, or as they are technically called at the dockyards, recorders, have been established. These recorders are perfectly independent of the executive or constructive officers. The duty of the recorders is to visit during the morning and during the afternoon each of the works going

New system.

Recorders of work.

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on at the dockyard, to take down the names of the men they find employed, to mark down in the diary the time that a man has been employed in his work, and to take these accounts to the expense account branch, where the labour is distributed over the several items on which the men have been engaged. So that we get by this system, a quadruple investigation: that the men are at work, that the men are on authorised work, that not only do they enter the yard and leave the yard morning and afternoon, but that twice in the day they are with hammer and chisel at their work, and not away from it. The system has another advantage. It produces an independent record, kept in an independent office, of the wages earned at each yard in the week, so that the Accountant-General, whose officer is in charge of the muster-books, and who pays the wages, can get, and does get from the Expense Account before he pays the wages, a check that the men have been found at their occupation, and that the amount of wages which they have earned in the different occupations tallies with the amount that they ought to earn by the record of their entries into the yard, as shown on the muster-book which is under the Accountant General's charge. The accounts have now been transferred to the Controller, and thereby to the Executive Officers of the yard, who are recognised at the yard as all-powerful and as really the controllers of the yard. The accounts are kept now in such a form that the necessity has ceased for the professional officers to prepare those extra unauthorised accounts, which were very costly; and the professional officers, within one week of the employment of a man on a ship and within one week of the building in of a ton of iron into a ship, know to a penny what was expended on that ship for labour and material, and further, by what department it was expended, so that they maintain perfect touch with the work as it goes along.

Advantages of new system.

Checks.

Unauthorised accounts unnecessary.

The work of the new branch was still further explained by Mr. Miller, who has been appointed to take charge of the Expense Accouuts. He showed in detail the check which would be secured on the cost of labour by the employment of a staff of recorders or time-keepers, and the mode of collecting the data for bringing into account the materials worked into ships.

Accountants and book-keepers can render valuable aid in the cause of good administration. But the skill in the use of materials, the energy in the direction and supervision of labour on which the cost and the quality of work depend, must be supplied, and can only be supplied, by the technical and professional men. In dealing with the huge manufacturing establishments conducted by Government this obvious truth is sometimes imperfectly appreciated. The office

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of the accountant is magnified, while that of the constructor is viewed as subordinate. In the private trade the manufacturer or the contractor, who is stimulated by the strongest motives of personal interest to cheapen and hasten production, will look, not to the accountants in the office, but to those whom he places in charge of the work out of doors, for the effective administration of a great industrial concern. In a great degree it is the same in the dockyards, the vouchers for the withdrawal of materials from stock, and the prices at which they are charged in the rate-book, are entirely under the control of the professional officers. The duty of Mr. Miller and his subordinates is to draw attention to any excess, or probability of excess, over estimates. In this way the superior officers in the department of construction are enabled to exercise an effective control over expenditure.

Accountant's office magnified; constructor's depreciated.

Contractors' practice.

Vouchers rate-book prices.

In this connection, it may not be superfluous to remark that a mere comparison of actual and estimated cost will not afford conclusive proof that a ship has been built economically. If such a test were accepted as sufficient the tendency would be irresistible to begin with high estimates. The professional officer in a dockyard has not the same inducement to cut down figures which operates in the case of contractors sending in competitive tenders. The necessary check on dockyard estimates, both for building and repairs, is supplied by the supervision exercised by Mr. Elgar, the Director of Dockyards.

Insufficiency of comparison of actual with estimated expenditure.

The transfer from the Accountant-General of the Navy to the Comptroller and Auditor-General of the audit of Store Accounts has been approved by the Director of Victualling and other principal officers examined by the House of Commons Committee. They feel that a higher degree of responsibility rests upon them than before; while the audit of a great department outside the Admiralty is more efficacious as a check than the audit of an officer, however highly placed, belonging to their own department. On this point the Committee of the House of Commons express concurrence with the Report of Messrs. Waterhouse and Mills, addressed to Mr. W. H. Smith. They consider that, with an efficient outside audit by the Controller-General, any departmental audit will become superfluous.

Audit of store accounts.

Intelligence Branch.

From Finance we pass to the Intelligence Branch of the Admiralty. An excellent summary was lately published in the columns of the *Army and Navy Gazette*, showing the valuable results achieved in a

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Establishment of the Foreign Intelligence Committee.

short space of time. "It was in 1883, if we are not mistaken, that the Foreign Intelligence Committee was established. Up to that time, there was no distinct department at the Admiralty for registering what other nations are doing, can do, and are ready to do in the event of war. Captain Hall took the work in hand, and of the way in which he did it, we may judge when Mr. Campbell-Bannerman speaks of it as of the highest importance to the efficiency of the naval service.

"In 1887, it was decided to graft upon the basis of the Foreign Intelligence Committee a larger and more important department, to be called the Naval Intelligence Department. Section I. was to include the duties of the old Committee; Section II. to organise the means—

"(*a*) For rapidly commissioning vessels in the First Reserve.

"(*b*) For the rapid completion to full complement of Coastguard ships.

"(*c*) For obtaining, fitting, manning, and commissioning, either at home or abroad, mercantile auxiliaries.

"(*d*) For showing at once how and where can be obtained coal, ammunition, and store-ships, with detailed list of wants, and names of persons and places they can be supplied from.

"(*e*) For framing plans of naval campaigns suitable for each station in the event of war with any given Power.

"(*f*) For the prompt provision of flotillas, fully manned and equipped for coast defence.

Staff.

"The staff was largely increased, and at first it was proposed to place an Admiral at the head of the newly-created Bureau. It was, however, soon recognised that to displace Captain W. H. Hall would be a grave mistake, and that officer was installed as Director of Naval Intelligence.

Captain Hall's work.

"Some idea of the work which has so successfully been carried out under the superintendence of Captain W. H. Hall, may be formed when we say that the prompt mobilisation of the ships for the Jubilee Review and for the manœuvres this year, could not otherwise have been accomplished. Every needful step has been taken to obtain a regular and organised supply of each description and grade of officer and men for manning ships of war and mercantile auxiliaries. For the first time in our history, the Commanders-in-Chief of the home ports are in a position to draw from their districts such reserves of men and officers as are required, and all arrangements have been made for rapidly manning ships in reserve, and for

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completing to full complement Coastguard ships and tenders. To the excellent business arrangements, untiring efforts, and exceptional tact of Captain Hall, the celerity and comprehension which have characterised the execution of the functions of the new department are largely due."

Former system.

It is due to the administrators of the past to say that they were not in quite so helpless a condition as it has been represented before the establishment of the Intelligence Branch. The promptitude with which the fleet was expanded to the full limit of the existing resources of the Navy, in the Crimean War, on the occasion of the Trent affair, and for the occupation of the Suez Canal, may be cited as proofs of not inefficient organisation. While vindicating the Admiralty of former years, it is a grateful duty to acknowledge that the Intelligence Branch has accelerated by days, perhaps by weeks, the means of expanding the Navy in a warlike emergency. For the good influence they have exerted in accomplishing this result public acknowledgment is due to Sir John Colomb and to Lord Charles Beresford. For the work already done Captain Hall deserves the highest credit. His mantle has fallen on a worthy successor in Captain Cyprian Bridge.

CONSTRUCTORS' BRANCH.

Turning to the Department of Construction, the procedure at the Admiralty in relation to the designs for new ships is described in the Report of the House of Commons Committee.

Routine as to new designs.

"With regard to the most important duty of determining the type of ship to be built, and accepting the design, Sir Arthur Hood (the First Naval Lord) distinctly states that for the designs of ships the Board at large is responsible. The course followed is thus described by him: 'The Board would first consider what type of ship was necessary or advisable. The Chief Constructor would then be instructed by the Board to prepare the design of such a vessel. When prepared, it would be thoroughly considered by the Controller and myself, and we should give our views upon it. After our views had been considered, the design would be placed before the Board of Admiralty for further consideration, and either approved or rejected.'"

Board Minute of 15th Feb. 1887.

This procedure is described in detail in a Board Minute of 15th February, 1887. The full responsibility for accepting a particular design would thus appear to be shared by the whole Board, although the part taken by the members in its preparation and approval must of necessity differ widely, and their degree of responsibility must vary in proportion.

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It does not appear practicable to improve the system of procedure at the Admiralty in relation to shipbuilding. An ample opportunity is afforded to the naval men at Whitehall and to the constructors to study and to advise on new designs.

Building ships in batches.

Great mistakes have been made in the past by building ships in batches before one of the type had been practically tried at sea. It is impossible to determine by calculation the behaviour of a novel type in a sea-way. Speed, immersion, carrying capacity, can be so determined. The qualities which constitute seaworthiness are more subtle, and can only be tested by experiment.

First Sea Lord's heavy duties.

It is a serious disadvantage that the First Sea Lord and his naval colleagues, upon whose opinion more than that of any other advisers the selection of a new design depends, are charged with so many other and anxious duties, that it is not possible to give a continuous and undivided attention to the great problem of shipbuilding. In a period of transition such a degree of attention, and not less, is demanded in laying down a programme of construction such as Lord George Hamilton has lately submitted to Parliament.

Assistance from experts outside the Admiralty.

Not only is it necessary that the subject should receive undivided attention; it is necessary that there should be a wide consultation of experts. Light may come as well from men outside as from those within the walls of the Admiralty. Before deciding on the expenditure of many millions, it would be well to hear what experts such as Lord Armstrong and Mr. George Rendel have to say, not less than those gallant officers who are in command of fleets. Experience and skill in the use of the arms which science has already placed in their hands do not necessarily guide men's minds to the changes of the future.

Inquiry by Commission.

When the time has come to take a wide survey, to look before and after, to elicit opinions from all competent authorities, and to decide between conflicting advisers, an inquiry by Commission is the most complete and satisfactory method of procedure. The Commission over which Lord Dufferin presided has been the chief guide of our constructors through the years which have elapsed since the publication of their Report. The interval has been long enough, the changes have surely been sufficiently great, to call for another inquiry. Such an inquiry should not cause delay in taking in hand the new construction for the Navy. It may with confidence be accepted that the types which the Admiralty have proposed are good in their several kinds. It is possible that a Commission, while approving all that has now been proposed, would suggest valuable additions to the scheme as it now stands.

Lord Dufferin's Committee.

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CHAPTER X.

The Defences of the British Empire and its Commerce.

In a war with a maritime Power, what are our risks and our means of defence?

We may conclude with a general survey of our position. What are the risks to which we should be exposed in a war with a great maritime Power? What are our means of defence? It is not necessary to give statistics of tonnage, commerce, and wealth. We live in "an island situate at the entry of the sea, and a merchant of the people for many isles." In the circumstances with which we have to deal, the British people will do well to follow the wise counsel of Aristotle, that "the Government should be organised with a view to military strength. The property of the State should not be so large that more powerful neighbours may be tempted by it, while the owners are unable to repel the invaders." It is a national duty to strengthen the Navy. If we allow our communications to be interrupted, our fortresses and coaling stations must fall, and the half of our food supply will be lost. If we keep our communications open, we can effectually guard our colonies and carry on our trade. No covering fleet can muster in the Channel, and we shall thus be secure against invasion. History furnishes abundant proofs that the loss of naval supremacy is the loss of empire. The defeats sustained by France at sea during the Seven Years' War led to the loss of Canada and India. Napoleon was driven out of Egypt by the battle of the Nile. Victory at sea made it possible for an English army to gain a footing in the Peninsula, and to maintain the struggle until the French were driven across the Pyrenees. It was by their command of the seas that the allied armies were enabled to besiege and capture Sebastopol.

A national duty to strengthen the Navy.

Admiral Porter's view of our position.

We have been rendered anxious in the past year by the apprehension of possible invasion. Admiral Porter, of the United States Navy, takes a reassuring view of our position. Recalling the fact that 70 transports, of 6000 tons, beside innumerable smaller vessels, were required to carry 23,000 men to Egypt, he estimates the fleet of transports required to carry 100,000 men at 3000 sail. "England,"

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says Admiral Porter, "may rest in peace. She will not be assailed upon her own shores."

England's real danger.

The real danger to England in the event of war is not invasion, but the interruption of her commerce. Unguarded wealth offers irresistible temptations to unscrupulous adversaries. We must show ourselves prepared in case of need to deal the first blow with crushing power. We must show ourselves prepared to sweep hostile cruisers from the seas. We must have commanding strength for the line of battle.

The basis on which an estimate may be formed of the requirements of the British Navy in respect to ships should be determined with reference to the operations to be undertaken in the event of war. Whoever the enemy might be, it must be assumed that on the outbreak of a war with England, the hostile vessels would be driven into port. If they kept at sea it would be the duty of the British fleet to pursue and to destroy them. To maintain an effective blockade it has been shown by Sir Geoffrey Hornby to be necessary that the blockading fleet should be twice as strong as the force blockaded. France being a possible enemy, a superiority of two to one must be the standard of strength for the British Navy. When the new Programme has been completed, we shall approximately reach the standard of strength which seems indispensable. In the comparative tables, Part IV., it is shown that England has 16 battle-ships of modern type, of 155,280 tons; France 12, of 114,203 tons. The ablest French writer on modern naval subjects puts the comparison of ships at 22 first-class and 17 second-class ironclads for England, and 10 first-class and 18 second-class ships—eight being of wooden construction—for France.

Relative strength of blockading and blockaded squadrons.

Number of battle-ships: England, France.

When the ships proposed by Lord George Hamilton have been added to the Navy, we shall have an aggregate strength in ironclads of modern type of 26 ships, of 285,280 tons. Including three ships now in construction, the total strength of France will be 15 ships of 147,203 tons. The superiority which Lord George Hamilton seeks to obtain is possibly sufficient for that duty of watching and blockading which the British Navy would be called upon to undertake in case of war.

Cruisers.

When we pass from ironclads to cruisers, it is not easy to fix a standard of strength which we can accept as adequate. In a recent leader the *Times*, after citing the statistics of the mercantile tonnage, remarked that, "if protection of commerce were taken as the sole basis of comparison, the British fleet ought to be six or seven times as strong as the French, even without taking into account the fact

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that the imperial and transmarine duties of England are far greater than those of France. It is not twice as strong nor anywhere near, it." When the programme of additional building has been completed the British fleet will possess 92 cruisers of 17 knots and over, with a displacement of 285,758 tons. The strength of the French in cruisers of equal speed, built and building, is 19 ships, displacement 53,280 tons. In cruisers we shall have a decided, though not perhaps an adequate, superiority.

Naval construction.

The rate of progress relatively to France.

It has already been said that our standard of strength in battle-ships should be twice that of France. We may take the same standard for our expenditure on construction. The Navy Estimates, for many years previous to the Treaty of Berlin, show the rate of progress in shipbuilding in England, as compared with France, to have been nearly in this proportion. We may appeal to the words quoted on the titlepage of the present *Naval Annual*. Cobden, speaking shortly after the Treaty of Commerce with France, declared that for many years a sort of tacit understanding had existed in France, whereby the naval expenditure of that country was fixed at about half the amount of the naval expenditure of England.

If we have a decided preponderance of maritime strength, it is evident that the foe will not be the first to throw down a challenge to an unequal contest. He will retire within the defences of his ports, and we must bar him in with fleets of double his strength. Our experiences have shown that some, perhaps many, ships will break out in conditions of weather favourable for the purpose. We must therefore be prepared to keep at all times in the Channel and in the Mediterranean an adequate force of battle-ships, armoured rams, and sea-going torpedo-vessels.

Defence of trade routes.

In addition to the task of watching the enemy's ports, there are certain routes by which the greater part of our trade passes. We should, in the view of Admiral Hood, be able to protect these trade routes efficiently. At the outbreak of war we should concentrate our ships in proper positions till the nature of the enemy's movements developes itself. Those positions must clearly be selected as near as may be to the great trade routes, due regard being had to the necessary facilities for coaling.

Lines of British trade.

In the First Report of the Defence Commission it is pointed out that the most important points of junction of the various lines of British trade are:—

(1.) At the entrance of the British Channel, where all these lines of trade unite.

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(2.) To the west of the entrance of the Straits of Gibraltar, where the Mediterranean and South Atlantic lines meet.

(3.) At the Cape de Verde Islands, where the line from South America falls in with that from the Cape of Good Hope.

(4.) Off the Cape of Good Hope, where the lines from India, China, and the East fall in with that of the outward bound Australian trade.

(5.) The northern entrance of the Straits of Malacca, where the Eastern trade divides.

(6.) Off Aden, where the trade of India and China meets the Australian steam homeward trade.

(7.) Off Melbourne, where the main branches of Australian trade join.

(8.) Off the Falkland Islands, where the various trades rounding Cape Horn and traversing the Straits of Magellan meet.

As we go further from the main focus of the war, the character of the force to be employed will be different from that required near home. To guard the highway to Australasia, whether by the Cape or from Aden, we shall require armoured cruisers of the Minotaur or belted-cruiser type, and protected cruisers of great coal power and coal endurance, such as the Blake type. To guard the highway to India and China, our second-class ironclads, of the Audacious type, with triple-expansion engines and a modernized armament, would be highly effective. Such vessels could be used for convoy when required.

Ships suitable for distant service.

It would be necessary to supplement our cruisers with mercantile auxiliaries. The capabilities and the function of the mercantile auxiliaries were described by Sir Arthur Hood in his evidence before the House of Commons Committee.

Mercantile auxiliaries.

"We have a certain number of the fastest ocean steamers in the world now fitted and ready to have their guns put on board. The guns are provided, and arrangements have been made to secure an efficient crew for each ship. A certain proportion of these steamers would always be in England and available for service, and these we should hope to be able to send to sea in about a fortnight as armed vessels. The mercantile auxiliaries would not fight with an enemy's war vessels, but would protect commerce from destruction by vessels of a similar type."

The subvention to merchant steamers in 1888–9 amounted to £22,380. The payment was made for six ships; nine others are at the disposal of the Admiralty. It was recently stated by Lord George Hamilton that no further payments are at present contemplated. It would be lamentable if the Government were to

Subvention to merchant steamers.

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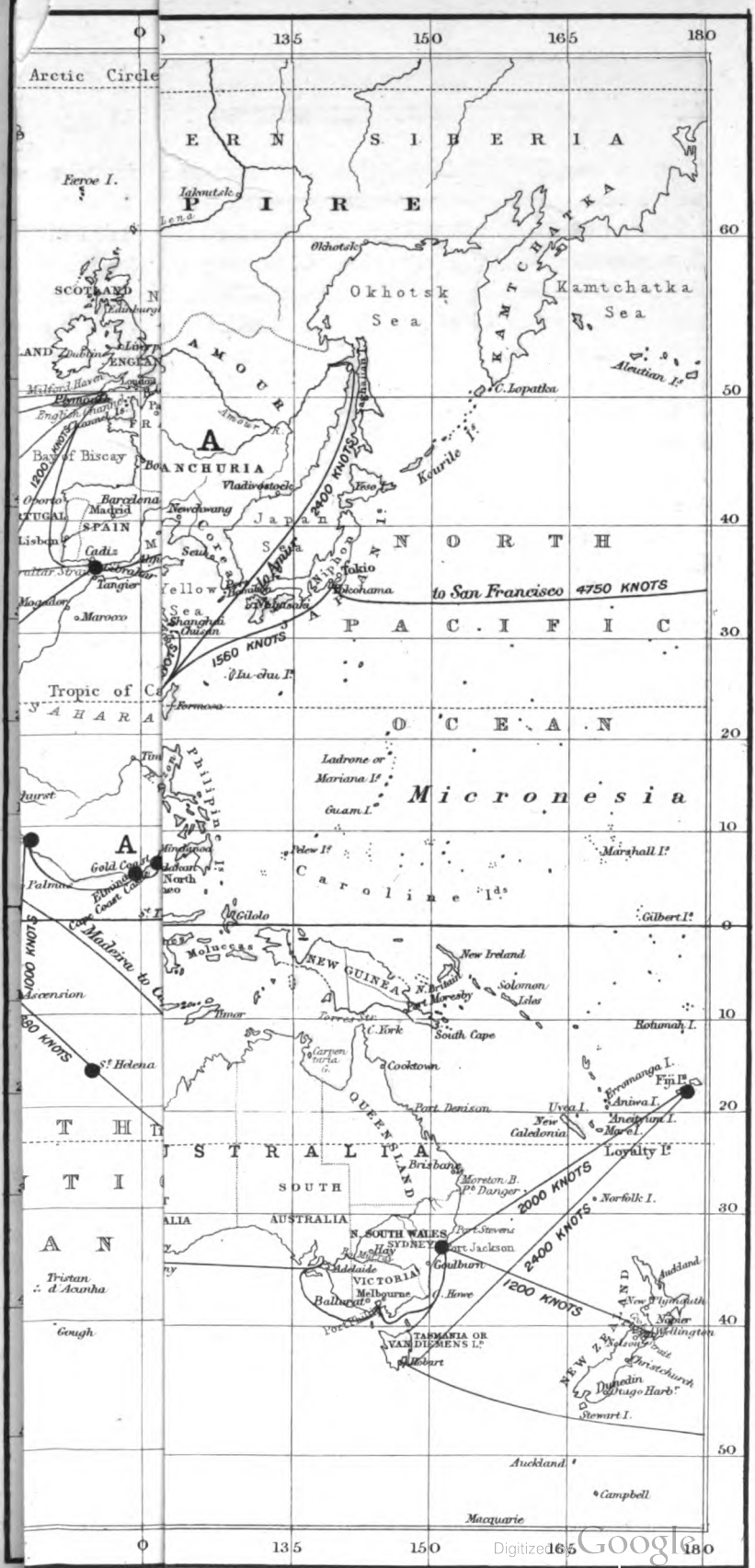

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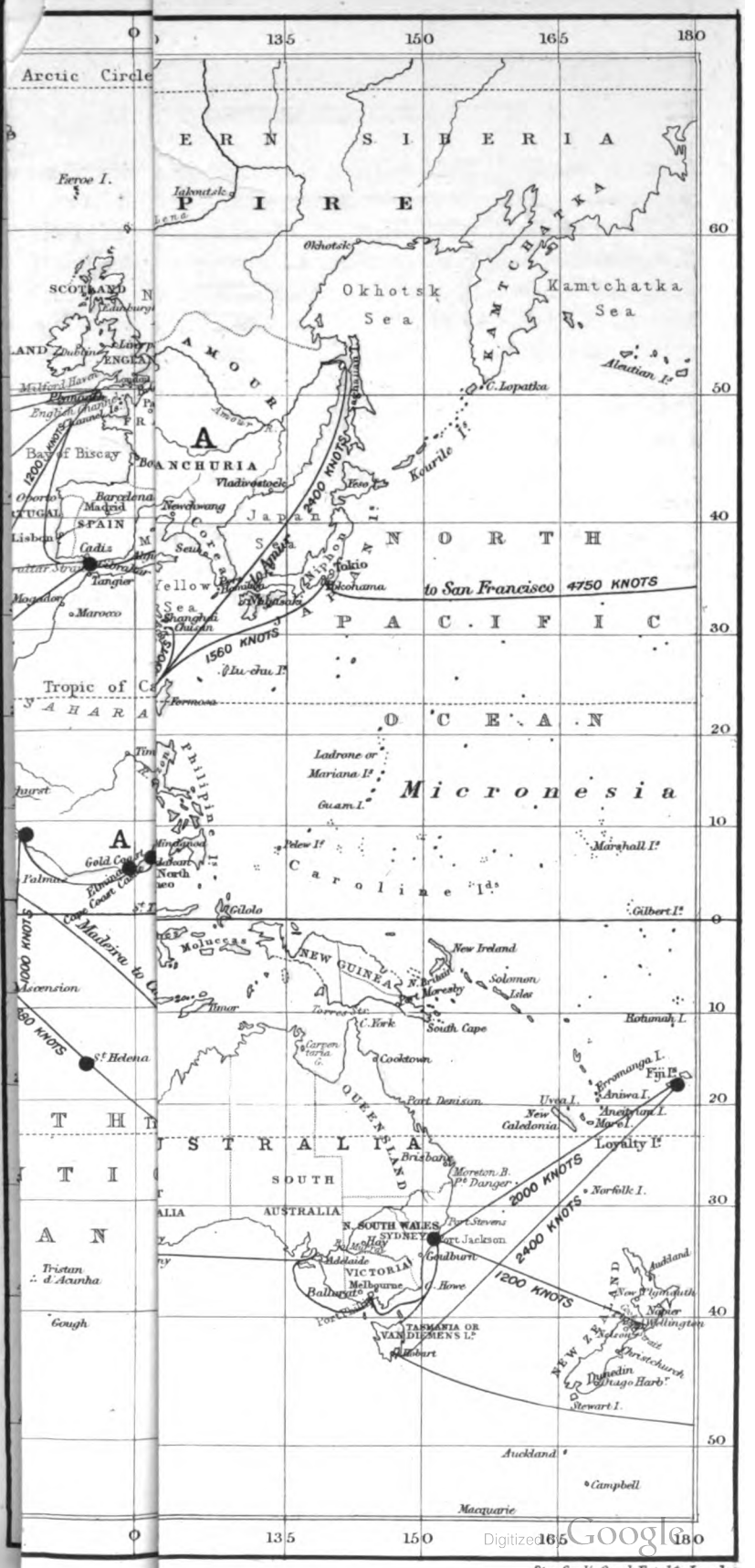

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M. Weyl's views.

The policy on which the Admiralty have entered is supported by high authority abroad. It is specially commended by M. Weyl, in his recent brochure on the relative strength of the British and French Navies. In France it is the accepted policy of the State to foster, by the artificial method of subsidies and subventions, the timid national enterprise in shipping. The great postal services across the ocean, conducted under the French flag, are maintained, and have only been brought into existence, by the payment of subsidies on a lavish scale.

Special requirements in subsidised ships.

Every ship in receipt of a subsidy for the ocean mail-service should be specially designed for conversion into an auxiliary cruiser, and should be capable of steaming 18 knots. Our Government should early take in hand the supply of efficient armaments for the merchant cruisers. The armaments at present in store at home and abroad consist of converted smooth-bores and some 40-pounder Armstrongs, mounted on truck carriages.

English yachts as scouts.

On the lines on which we have proceeded in securing certain selected vessels of the Mercantile Marine for the service of the Navy as cruisers, it would seem perfectly practicable to organise in the great pleasure fleet of England an auxiliary flotilla of scouts. The Government of the United States has taken practical steps in this direction. The numerous steam yachts under the American flag have been examined, and a list of those deemed suitable to render assistance to the Navy has been prepared.

Defence of coaling-stations and docks.

As all our operations will depend on keeping up the supply of coal, our coaling-stations and docks abroad must be adequately defended by fortifications, properly armed and efficiently manned.

Part IV. contains reports reprinted from the *Army and Navy Gazette* as to the state of defence of coaling stations.

At the Cape some necessary works have not yet been taken in hand. Without railway communication between Cape Town and Simon's Bay the garrison cannot be effectively handled to resist an attempt on the part of an enemy to make a landing. The harbour-works at Table Bay are already of the utmost value to trade and to the Navy. No greater boon could have been given to navigators in those seas than the noble breakwater which will prevent Table Bay from being the scene of the awful losses of former days, when the roadstead was open to the northerly gales that occasionally

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sweep those seas. An extension both of the inner basin and the breakwater would be highly desirable. The Cape Government now asks for a grant-in-aid from the Imperial Government, to be paid by deducting a certain sum annually from the debt of £400,000 due from the Colony. The repayment should commence in 1890.

So far as the information in the possession of the compiler enables him to judge, the works required at the coaling stations are in rapid progress.

It is reasonable to hope that the expenditure under the Imperial Defence Loan, judiciously applied, will go far to complete the armaments for the coaling stations.

Manning the defences abroad.

We have not yet made complete provision for manning the new defences. Our British garrisons are insufficient. It is not desirable that Englishmen should be employed in the unhealthy climates of our tropical coaling stations in such numbers as would be required in time of war. It would be preferable to adopt the excellent plan which we have followed in India, and we have the assurance of the Secretary of State for War that the policy is being steadily pursued of utilising, as far as is prudent and possible, the services of native auxiliaries. At several stations European volunteers can be enrolled in limited numbers.

Dry dock accommodation is required.

Dock accommodation is required at several important stations. The Committee of the House of Commons advise that the docks should be proceeded with. They are urgently required in Ceylon, Mauritius, and at Singapore, and should be capable of receiving vessels of war. At Gibraltar, with its great military expenditure, justifiable only by naval considerations, a dock has not yet been provided. Lord Sidmouth and others are pressing the question on the consideration of the Government. A part only of the expense of making docks would fall on the State. It would be sufficient to pay subsidies to private companies who would be prepared to build or to enlarge existing docks for the purposes of the Government. The docks at Hong Kong were recently enlarged at the joint expense of the Treasury and of the local company.

For the commercial harbours at home the Navy is the first and chief line of defence. We have seen that however strong that line of defence may be, it will here and there be broken through by casual raiders. They must be met by a second line of defence—by a coast-flotilla, manned by volunteers, led by a few officers and men of the Navy. Behind the coast-flotilla we require land defences, which need not be costly nor armed with many heavy guns. Happily our commercial harbours are difficult of approach, and could be easily

Second line of defence.

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defended. Liverpool, London, Bristol, Hull, are situated within estuaries, which may be barred to an enemy by mines, obstructions, and forts.

Defence of dockyards.

The defence of the dockyards should keep pace with the development of the powers of attack. For the protection of Devonport an additional battery to the westward of the Maker heights has been recommended by a competent writer in the *Army and Navy Gazette*. From the same source we have a suggestion for an additional fort for the defence of the outer waters at Spithead.

The recent progress in the armament of works was detailed in the *Army and Navy Gazette* of February 25, 1888 :—

Recent progress in the armaments for defence.

"About 900 heavy guns have been got into position in the scope of the defence scheme. In the armament of our defences are included 100 7-in. R.M.L. guns, and 400 9-in. guns. We have 400 guns of a more formidable character, comprising two 80-ton guns, about one hundred and twenty 38 and 25-ton guns, the balance being nearly all 10-in. guns of 18 tons. Commencing with Harwich, upon which £76,400 has been, by subsequent vote, expended, we find the Languard Fort the mainstay, with its 18-ton guns. The Thames has about forty effective heavy guns, scattered at considerable distances from the Isle of Grain to Tilbury. The Medway and Sheerness Forts protect the Chatham district on the one side with nearly forty effective heavy guns, Garrison Point being particularly well defended. Dover possesses about twenty guns, including the two of 80 tons upon the pier. Portsmouth has a larger proportion of 38-ton and 18-ton guns than any fortress in England, if we include the Isle of Wight. Portland is strong. Plymouth has some sixty heavy and effective guns in its breakwater fort and outlying batteries, and the natural position of these is so excellent that it is almost unrivalled in England. We have purposely excluded the 9-in. and lower natures of muzzle-loading guns as insufficient for defence against ironclads. Pembroke is so easily assailable that the Defence Commissioners did not recommend any works being undertaken for it beyond those then in progress. Stack Rock is strong, and its armament of 12 and 10-in. guns is well placed; but the liability to be taken in flank exposes the entire position. Cork has several excellent batteries of 12 and 10-in guns, one of which—Fort Carlisle—is only lately completed. The Severn is in a most helpless condition, having only about thirty 7-in guns."

At home the organization of the local floating defence of the coasts and harbours is a necessary service, for which no provision has

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yet been made. The subject has been dealt with in a previous chapter.

A foreign observer. Having now considered our defences from a British standpoint, it may be interesting to have the impressions of an intelligent foreigner on our present position. Let us accompany the writer of an able brochure, "La puissance maritime de l'Angleterre," on a voyage of inspection to the furthest East.

Gibraltar. Gibraltar is described as practically impregnable. It is suggested as the only effective means of attack, that Spain should establish powerful batteries on the hills above Algeçiras. The Spanish guns would command the Bay of Gibraltar, and if its shelter should be denied to the ships of both nations, the loss to England would be much the greater.

Malta. Proceeding up the Mediterranean, Malta, the pivot of our naval operations, is acknowledged to be scarcely inferior to Gibraltar in

Cyprus. the strength of its defences. Cyprus is commended as a strategical position of the first importance, commanding Asia Minor and Syria, and capable of being easily placed in a good state of defence.

Egypt. Egypt is another great strategical position. Situated on the isthmus joining Africa to Asia, and on the shores of the Mediterranean, with Syria, Arabia, and Tripoli as glacis to the central fortress, the Power which rules Egypt may make its influence felt in the Euphrates, and on the borders of Asia Minor, and will command the road to India.

Aden. Aden is compared to a huge pitchfork, with three prongs. The compiler would select the image of a gigantic cinder as more picturesque and descriptive. The fortifications of Aden are recognised as impregnable, and the position as admirably chosen to command the Gulf of Aden and the entrance to the Red Sea.

Kurrachee. India is secured against an attack by sea by the limited number of its ports, and the distance from any base available for hostile operations. Bombay is the commercial capital of India, the terminus of the principal trunk lines of railway, and a position of vital importance. The fortifications are in hand; a large graving-dock is promised. The great distance from any coaling station on which an enemy could depend would render an attack on Bombay difficult. In an equal degree Kurrachee, and in a scarcely less degree Ceylon, possess the same guarantee against attack.

Without entering into military details not appropriate to the present compilation, it may be said that it is recognised by foreign

Defence of India. observers that the defence of India depends primarily on the maintenance of that naval supremacy which gives us our hold upon

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Egypt, Aden, and Burmah, and under the protection of which we should be able to pour in reinforcements. In less than three weeks from the departure from England, troops could be massed at Quetta or Peshawur for the defence of the only opening in the great barrier of the Himalayas through which conquering armies have ever penetrated.

Singapore, Labuan, and the settlements of the North Borneo Company, which are rapidly acquiring great material prosperity, complete the chain of positions connecting the metropolis with Hong Kong—the third port of the British Empire. It will be evident that the well-informed writer whom we have followed in our rapid survey thinks the reduction of our strong places abroad no light or easy enterprise.

If we turn to the Report of the French Parliamentary Committee on the Navy Estimates for 1889, we find the resources of our neighbours for the conduct of naval operations in distant waters slender indeed in comparison with those which we command. The Committee enumerate the local establishments maintained for the Navy in the French colonies. The list includes Madagascar, Comoro Islands, Senegal, Western Guinea, Congo, Gabon, Guiana, Tahiti, New Caledonia, and Obock. The only graving docks belonging to the French Navy abroad are those in Cochin China and Martinique. Depots of coals are maintained for the French Navy at all the naval yards abroad, and at Reunion, Tonkin, Gaudaloupe, the Island of St. Peter's in Newfoundland, and Pondichery. The Committee anticipate that, in the event of war, the only ports from which supplies could be drawn for the French Navy would be those of Corsica, Algeria and Tunis. They urge that the special attention of the Naval Department should be given to the defence of these ports. Two years ago, a Rear-Admiral was sent to Corsica to organise the defence of the island and to provide harbours-of-refuge for torpedo-boats. Similar steps were taken at Biserta, where an attempt had been made to deepen the entrance to the harbour. These efforts appear to have been subsequently abandoned, not without causing some serious alarm to those who appreciate the importance of these positions in the event of naval operations in the Mediterranean.

French resources abroad.

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CHAPTER XI.

Immunity of Private Property from Capture at Sea.

International agreement suggested.

The declaration of Paris.

There is yet another method by which protection may be given to maritime commerce. It would be a forward step in the progress of civilisation if the great powers were to enter into an international agreement that private property should not be captured by an enemy's cruisers. They went far in this direction in their solemn declaration, made at Paris on the 16th April, 1856. On that occasion England stood alone in opposing the surrender of belligerent rights. Our opposition prevented the United States from acceding to the declaration in the terms in which it was accepted by the other powers.

Attitude of the United States.

France.

If the subject were again raised for discussion at an international conference, we need not apprehend any disposition on the part of the United States to recede from the attitude which they assumed in 1856. In France a section of the public, led by Admiral Aube, has declared for the harshest and the meanest methods of doing injury to an enemy. Their views have been repudiated by other eminent members of that same noble profession to which Admiral Aube belonged, and having equal authority to speak on its behalf.

In an admirable contribution to the *Nouvelle Revue* Admiral Bourgois has denounced in dignified language the methods of warfare which some were recommending for France. The destruction of unarmed passenger steamers in the night by torpedo-boats is repudiated as inconsistent with the engagements into which France entered on the occasion of the Declaration of Paris. It was a retrograde step from the sentiments expressed by the signatories of the Convention of St. Petersburg. That Convention rested on the broad principle that the progress of civilisation should attenuate as far as possible the calamities of war. The sole legitimate aim for which States when at war should strive is the weakening of the fighting power of the enemy.

Convention of St. Petersburg.

We have a later and a more authoritative statement from the

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French Minister of Marine. Speaking in a debate in the Chambers, on the 29th October, 1888, Admiral Krantz expressed himself as follows :—

Admiral Krantz's views.

"The only nations which can fit out privateers are the United States and England. The wars of the future will be fought by armed nations. The issue will be decided in a few months. In so short a struggle little injury can be done to the commerce of an adversary. During the wars which lasted from 1812 to 1824 privateering was largely resorted to. With what result? We had taken some merchantmen from our foes. But we had lost our sailors. They were prisoners in English hulks. Privateers are always doomed in the end to be captured. It is their inevitable fate."

Nelson's views.

Nelson and his comrades in arms in the great war were strongly opposed to privateering. They condemned it as little better than piracy. We have more interest in securing immunity for private property from capture than any other nation. "It is," said Admiral Hood, "utterly impossible, in the case of a country with 10,000,000 tons of floating commerce, to protect that floating commerce thoroughly by any number of fast cruisers which the taxpayers of this country would be willing to provide."

Admiral Hood.

Sir Geoffrey Hornby.

The masterly statement of Sir Geoffrey Hornby, before the London Chamber of Commerce, may be cited in confirmation of the opinion of Admiral Hood. Admiral Hornby referred to the experience of former wars. At the end of their Civil War the United States had some 700 vessels in commission. If such forces were necessary to give protection to a relatively insignificant maritime trade from foes so feeble, we may infer what our difficulty would be in a more severe struggle.

The neutral flag.

The experience of history shows what is certain to happen in the future. It is beyond doubt that merchants will, as far as they can, secure immunity from capture by placing their ships and goods under the protection of the neutral flag. In 1803 we have a despatch of Lord Nelson's, in which he complains that "whereas at the commencement of hostilities 170 French vessels were in the Black Sea, by a magic touch they became in a moment Russians, Imperials, Ionians, Ragusans, and not one French vessel remains."

General Shipowners' Society.

How cordially the principle of the entire immunity of private property from capture at sea would be approved by the great mercantile interests may be inferred from the appeal made by the General Shipowners' Society to the Government in 1885. They urged that it would be public policy for the Government to announce that in the event of war with Russia it would hold our flag free from

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capture and seizure, and would give compensation to the owners in the event of the capture of their property. All the arguments put forward by the shipowners in 1885 hold good in favour of establishing by international agreement immunity of private property from capture. The shipowners insisted on the certain burdens on trade of heavy war risks, the consequent transference of British vessels to neutral flags, the probable loss during war of our preponderance in the carrying trade, the chance that trade once lost would never return to our flag, the risk of interruption of our food supplies, and lastly on the certainty that no damage we should have it in our power to inflict would seriously affect any probable enemy.

The shipowners' argument.

A long step in civilisation.

It would be a long step in civilisation if England were to announce to the nations that in any future naval operations it would not touch the private property of the enemy and would treat captures from her own subjects as national losses. But England should not stand before the nations in such a cause in the attitude of a suppliant, nor accept compliance with her demands as a concession from strength to weakness. England's voice must be that of the strong man armed. It must be made plain that her advocacy of a policy of forbearance is inspired, not by fear, but by generosity.

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CHAPTER XII.

The Escape of H.M.S. Calliope.

While these sheets were going through the press tidings reached England of the awful hurricane at Samoa, which caused disasters, which we sincerely deplore, to the ships of friendly powers, attended with a lamentable loss of life. The British ship present escaped after a fearful struggle. The Calliope was handled with admirable courage and skill, both on deck and in the engine-room, and the ship exhibited the highest qualities in relation to seaworthiness and machinery. **Hurricane at Samoa.**

The following notices of the disaster appeared in the *Times*:—

"A telegram from Sydney, New South Wales, says:—Her Majesty's ship Calliope arrived here this morning from Apia, Samoa, bringing full confirmation of the terrible and destructive hurricane last month, and particulars of her own wonderful escape from the fate which befell the American and German men-of-war. The captain of the Calliope states that the ship's barometers gave due warning of the approaching storm, but no one supposed it would be more serious than others which had been previously experienced. The usual precautions, however, were taken. Even when the barometer had fallen unusually low and the hurricane was almost at its height, some natives on board the Calliope declared that it was nothing more than an ordinary storm. The hurricane increased in fury every hour, and at length it became evident that the Calliope in her then position would not be able much longer to stand against it. Already, one after another, the cables of four out of her five anchors had parted before the tremendous strain, and the vessel had commenced to drift. One anchor alone was holding her, and that was perceptibly dragging. For a while the captain thought the best plan would be to beach the Calliope on a soft patch to which he thought he could guide her. But such tremendous seas were running that it seemed impossible that any ship could hold together for long after being run ashore. The captain therefore determined to risk everything in an attempt to reach the open sea beyond the dangerous reefs. The remaining anchor was therefore slipped, and the Calliope's head turned toward the most practicable opening in the line of reefs. The wind at the **Telegrams from Sydney.**

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moment was blowing with tremendous force. The Calliope's engines, capable of steaming at a speed of 15 knots, seemed almost powerless, and, as a matter of fact, the highest speed attained in the teeth of the gale was half a knot, at which rate the vessel gradually got out of the dangerous harbour. The Vandalia, of the American squadron, was still holding by her anchors, and the Calliope twice came into collision with her, but fortunately without serious damage to either vessel. The Calliope, however, sprung her foreyard, damaged her head and stem, and lost all her boats, except one, partly by the collisions, and partly by the seas. She did not, however, lose a single man, though one seaman was seriously hurt, but his injuries are not considered dangerous. Thousands of people have flocked to see the Calliope, and the knowledge of the splendid manner in which she was navigated out of Apia harbour has aroused the greatest enthusiasm here. The officers have been overwhelmed with congratulations from all sides, and Lord Carrington, the Governor, has personally inspected the ship, and expressed his admiration and congratulations to the officers and crew."

The Vandalia.

The Calliope is under the command of Captain Henry C. Kane.

Hurricane in Samoa.—Men-of-War Wrecked.

Philadelphia, *March* 30.

Admiral Kimberly, commanding the American Samoan Squadron, has telegraphed as follows to the Secretary of the Navy :—

The American Admiral's telegram.

"Hurricane at Apia on March 15. Every vessel in the harbour is ashore, except the English ship Calliope, which got to sea.

"The American ships Trenton and Vandalia are total losses. The Nipsic was beached, with her rudder gone, and may be saved; but the chances are against it. Captain Schoonmaker, 4 officers, and 93 men of the Vandalia were lost. The Nipsic lost 7 men. The Trenton's crew were all saved.

Losses.

"The German ships Adler and Eber are total losses. The Olga was beached, and may be saved. The German losses number 96."

German losses.

Admiral Kimberly having asked for orders to send 300 men home, the Secretary of the Navy sent him full power. The American vessels lost are wooden corvettes. The Trenton, flagship, was of 3900 tons, the Vandalia of 2100, and the Nipsic of 1375. They had 800 men on board.

Auckland, *March* 30.

A terrific hurricane, which raged for well-nigh two days, broke over the Samoan Islands on the night of March 16. Its effects upon

Berlin telegram.

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the shipping, and especially the foreign men-of-war stationed in those waters, was disastrous in the extreme.

"The storm burst before the ships could escape from the insecure anchorage at Apia, and although they made every effort to get out to sea and away from the dangerous coast, only Her Majesty's ship Calliope, out of the seven foreign war-vessels caught by the hurricane, was so fortunate as to make the open sea. Drifting before the gale, she headed seaward and escaped, setting sail for Sydney. Those that remained were overtaken one after the other by utter disaster. The fury of the wind was tremendous.

German vessel Eber.

"The German gunboat Eber was the first to drag her anchors and to be driven, totally helpless, upon the coral reef which surrounds the harbour of Apia. She struck, broadside on, at 6 o'clock in the morning. The ill-fated vessel gave a lurch, then staggered back from the shock and went down in a moment in deep water. Most of the men on board were under hatches, and scarcely a single soul escaped.

German vessel Adler.

"Her consort, the Adler, was the next to succumb to the remorseless gale. She was lifted bodily by a gigantic sea and cast on her beam-ends on the reef. Then followed a terrible struggle for life. Many of the sailors plunged into the raging surf and struck out for the shore. Some reached it. Others clung to the rigging until the masts went. Of these, too, some afterwards made their way to the land. Several of the officers, among them the captain, were saved.

American vessel Nipsic.

"Meanwhile, the United States sloop of war Nipsic had been dragging her anchors and drifting towards the shore. Happily, the captain had not lost all control over his ship, and he was able to run her ashore on a bank of sand. The boats were lowered and the whole ship's company reached the land in safety, except six men who were drowned through the capsizing of one of the boats.

American corvette Vandalia.

"The American corvette Vandalia met with a worse fate. Like the Eber, she was carried before the gale right on to the reef. The captain was hurled by the shock against a Gatling gun and rendered insensible. While he lay unconscious on the deck a sea swept the deck and he was washed away. The vessel sank about 50 yards from where the Nipsic lay. Of the officers and crew, several were washed overboard and drowned. Others perished after a hard struggle to swim ashore. Others remained for hours in the rigging, which still remained above the water, but were carried away one by one by the great waves that never ceased to dash over them.

"By this time night had come on, and although the European residents and the native Samoans were gathered on the shore eagerly anxious to help the hapless sailors, they could do nothing in the

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darkness. Not long after the Vandalia had gone down, the American corvette Trenton broke loose from her anchorage and was driven upon the sunken wreck of the Vandalia. Then she drifted on to the shore, with her bottom completely stove in and with her hold half full of water. Fortunately, although the ship was totally lost, all on board of her were saved.

German corvette Olga.

"As morning broke, the German corvette Olga, which had up to that time withstood the gale, although she was much battered, became unmanageable and was driven on to the beach, where she rested in a tolerably favourable position. Not one of her crew was lost. The record of the losses is as follows:—Eber—captain, all officers except one, and 76 men; Nipsic—6 men; Vandalia—captain, 4 officers, and 40 men; Adler—altogether 15.

"Some slight hopes are entertained of floating the Olga, and Mataafa sent a number of his men to the shore, who rendered splendid service in the combined efforts made to get her off the beach. There is also just a possibility of saving the Nipsic, but it is not likely.

Merchant shipping losses.

"The merchant shipping on the coast suffered as much as the men-of-war, the barque Peter Godeffroy and seven coasting vessels being wrecked and four persons drowned."

Mr. Goschen.

In his speech at Sheffield on the 22nd May, Mr. Goschen told the story of the Calliope in graphic language. He spoke as follows:—"I am going to remind you of a circumstance of which every Briton will be proud. I wonder how many of you have read of the story of that gallant ship the Calliope, which alone of the ships in the harbour of Samoa, when the fiercest hurricane almost of the century blew, rode out the gale and made away, you remember how, surrounded by the coral reefs, with the ships of war of other countries drifting around her, through seamanship, through the strength of the craft, through the perfection of the engines, and the work of the crew, a monument, I hope, to all time that seamanship, nerve, and perfection are still characteristic of the British Navy. I read yesterday the report of the captain of the Calliope. It will be published in a few days and you will read it for yourselves. But I will tell you one of the points which struck me most in this splendid achievement. Remember what are the criticisms that are mainly made upon our ships. It is that the boilers are never adequate, it is that the engines are generally defective, it is that generally the stokers are too few, and that the steering of our ships is unsatisfactory. If in any one of these respects there had been a default, the Calliope would not now be the glory of all those who rejoice in the doings of the British Navy, but her crew and the ship itself would be beneath the waves of

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the Pacific in Samoa. But there was no default, and the Calliope was saved. Let me read to you one passage, one graphic and simple passage from the captain's account:—

Extract from Capt. Kane's report.

"'I called on the staff engineer for every pound of speed he could give us, and slipped the one remaining cable. The engines worked admirably, and little by little we gathered way and went out, flooding the upper deck with green seas which came in over the bows and which would have sunk many a ship. My fear was that she would not steer and would go on the reef in the passage out, especially as the Trenton, the American ship, was right in the fairway, but we went under her stern and came up head to wind most beautifully. Once outside her it was nothing but hard steaming. If the engines held out we were safe. If anything went wrong with them we were done for, but thanks to the admirable order in which the engines and boilers had been kept we steamed out in safety into the Pacific.'

"So splendid, so heart-stirring was the sight of the ship as she steamed out into safety that the brave men who were manning the drifting and sinking ships around her cheered her as she passed, and the emotion of admiration in them was so strong that they lost the sense of their own danger and paid a tribute to the finest piece of seamanship they had seen. I commend this little naval history, for such it will prove to be, to the British public, to the British workmen. I commend it to them that they may see that when we ask them for money it is put into ships that are worthy of the traditions of the Navy. I say that if we can still secure such exploits the money is not wasted."

Sinking of the Sultan.

While we have been more fortunate than others at Samoa, we have sustained a deplorable loss in the Mediterranean by the sinking of H.M.S. Sultan. It will not be necessary to give particulars of an event which is fresh in the public recollection.

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CHAPTER XIII.

RECAPITULATION OF SUGGESTIONS OFFERED IN 'NAVAL ANNUAL,' 1887.

THE economies and reforms of naval administration urged in *The Naval Annual* for 1887 are again submitted to the consideration of the reader in the publication for 1888–9.

DOCKYARDS.

Closing of dockyard schools.

Reduction of medical staff in dockyards.

More prompt reward of special exertions by professional officers and their subordinates.

Classification of workmen. Gradations of pay. More frequent dismissal of the idle and incompetent.

Selection of foremen for ascertained personal fitness to carry out work, and not by paper examinations.

Relative rank to be given to members of Corps of Constructors. The head to rank, as in France, with a Rear Admiral.

EDUCATION AND TRAINING.

Removal of the Britannia to an anchorage between Ryde and Osborne.

Young officers to have more instruction than at present in navigation, and especially in pilotage. Vessels of the Sunbeam type to be kept constantly at sea, by night and by day, working in and out of harbours and roadsteads, round the Goodwin Sands and along the East Coast of England. Pilotage to be entrusted to the officers under instruction, under supervision. Let us remember Lord Nelson's early experience in the estuary of the Thames as leading up to the masterly handling of the Fleet at the Nile and Copenhagen.

Modern languages to be more studied and encouraged.

Engineers to have opportunities of seeing the management of engines in the best steamers on the North Atlantic.

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GUARD-SHIPS.

An efficient sea-going ironclad to relieve the Revenge at Queenstown, the Royal Adelaide at Plymouth, the Duke of Wellington at Portsmouth, the Hibernia at Malta, the Victor Emanuel at Hong Kong, and the Urgent at Jamaica.

The Liffey store-ship to be abolished.

TROOP-SHIPS.

The Indian troop-ships to be laid up, and the relief of troops to be carried out under contract with the great steam-ship companies.

FOREIGN SQUADRONS.

The foreign squadrons to be carefully revised.

On certain stations small vessels to be withdrawn. Commence with the ships stationed on the western seaboard of the Atlantic.

The flying squadron to visit at intervals the shores of the South Atlantic and the ports of Canada and the United States.

AUSTRALIAN SQUADRON.

The great political importance of an efficient squadron insisted upon.

Such a vessel as the Imperieuse or Warspite should be the flag-ship.

A belted cruiser has not sufficient accommodation for an Admiral having the social duties of Commander-in-Chief on the Australian station.

Two belted cruisers to take the place of the corvettes of the C class, which have until recently been kept on the station.

A Colonial Britannia much needed in Australia.

ORDNANCE.

The supply of ordnance to be established on the improved system introduced in France since the war with Germany.

More experiments before guns and ships are ordered in batches.

NAVAL RESERVE.

The reserve of officers in the Mercantile Marine to be more closely bound up with the Royal Navy.

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Naval Reserve men to be embarked in ships engaged in the annual manœuvres.

Encouragement to be given to the Naval Volunteer movement, and to the Colonial Naval Reserves.

COMMANDER-IN-CHIEF, QUEENSTOWN.

The Rear-Admiral at Queenstown to have a more active post. To command the Coast Guard and First Reserve ships in Ireland. To be second in command of the Reserve Squadron in the annual cruise.

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PART II.

BRITISH AND FOREIGN

ARMOURED AND UNARMOURED SHIPS.

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PART II.

I.

BRITISH ARMOURED AND UNARMOURED SHIPS.

THE list of ships of the British Navy has been compiled from various sources. The official *Navy List* has been the principal guide, and the list is also in accordance with Lord Charles Beresford's Parliamentary return for 1888, No. 218, and with the Navy Estimates for 1889–90. As a rule the displacement and indicated horse-power have been given as stated in the *Navy List*. Wherever possible the column under the heading "speed" has been filled up from reports of actual trial. With respect to the gun and torpedo armament, it is to be noted that, owing to the substitution of breech-loaders for muzzle-loaders at present in progress, to the advance in the power of machine-guns, and to the improved methods of ejecting locomotive torpedoes, changes are being continuously made. The columns for "coal-endurance" have been filled, as far as was possible, from the most authentic published reports of the trials of the several ships. Generally the mileage traversible at the speed mentioned has been computed from the quantity of fuel that can be carried in the bunkers. The computations, moreover, have been based upon performances, or estimates of performances, under the most favourable conditions.

The sketches of the ships are all drawn on the same scale (except in a few cases specially indicated), so that their relative sizes are apparent by inspection.

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GREAT BRITAIN.—Armoured Ships.

a.c., armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *br.*, broadside ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t.*, turret-ship; 2 *s.*, two screws.

M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; l., light guns under 15 cwt., including boats' guns; Q.F., quick-firing gun; M., machine gun; *comp.*, compound or steel-faced armour; f. tu., l. car., fixed tube or launching carriage for Whitehead torpedo discharge.

Class.	NAME.	Displacement.	Indicated Horse-Power.	Draught of Water. Extreme.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Completion.	Cost.		Armour.			Backing.	Armament.		Speed.	Coal Endurance.	
										Hull.	Machinery.	Side.	Bulk-head.	Turret.		Guns.	Fish Torpedo Dischargers.		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
		tons.		ft. in.	ft. in.	ft. in.				£	£	in.	in.	in.	in.			knots.	tons.	knots.
br.	**Achilles** (iron)	9820	5720	27 3	380 0	58 3½	Chatham	Penn	1864	375,429	69,117	4½	4½	..	18to10	14 12-ton M.L.R., 2 6-in. 5-ton B.L.R., 8 Q.F., 14 M., 6 l.	..	14·32	750	2500
t.	**Agamemnon** 2 *s.* (iron)	8660	6360	24 0	280 0	66 0	Chatham	Penn	1883	402,295	101,770	18 & 15	16½ & 13½	16 & 14	18 to 9	4 38-ton M.L.R., 2 6-in. 81-cwt. B.L.R., 6 Q.F., 13 M., 2 l.	2 l. car.	13·25	960	4100
br.	**Agincourt** (iron)	10,690	6870	27 9	400 0	59 5	Birkenh'd	Maudslay .	1868	381,700	83,777	5½	4½	..	10	17 12-ton M.L.R., 15 M., 14 l.	2 l. car.	14·8	750	1300
t.	**Ajax** (iron) 2 *s.*	8660	6440	24 0	280 0	66 0	Pembroke	Penn	1883	411,622	106,735	18 & 15	16	16	18 to 9	4 38-ton M.L.R., 2 6-in. 81-cwt. B.L.R., 6 Q.F., 13 M., 2 l.	2 l. car.	13·25	960	4100
c.b.	**Alexandra** . 2 *s.* (iron)	9490	8610	26 6	325 0	63 8	Chatham	Humphrys	1877	394,263	120,061	12 to 6	8 to 5	..	12 & 10	2 25-ton M.L.R., 10 18-ton do., 6 4-in. 22-cwt. B.L.R., 14 Q.F., 6 M., 4 l.	4 l. car.	15·00	680	2700
b.	**Anson** (steel) 2 *s.*	10,600	11,500	27 3	330 0	68 6	Pembroke	Humphrys	1889	*x* and *y* 724,765		18 *comp.*	16 *comp.*	barbette 14 & 12 *comp.*	12to15	4 67-ton B.L.R., 6 6-in. do., 19 Q.F., 7 M., 2 l.	1 f. tu., 4 l. car.	16·75	1200	7100
c.b.	**Audacious** . 2 *s.* (iron) (Zinc Sheathed)	6010	4830	23 8	280 0	54 0	Glasgow	Ravenhill .	1869	193,863	52,619	8 to 6	5	..	10	10 12-ton M.L.R., 8 4-in. 22-cwt. B.L.R., 10 Q.F., 5 M., 4 l.	4 l. car.	13·2	500	1260

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a.c.	**Aurora** (steel)	2 *s.*	5600	8500	22	6	300	0	56	0	Pembroke	J. & G. Thomson	1889	220,550 *x*	64,000 *y*	10 *comp.*	16 *comp.*	12 conning tower.	6	2	9·2-in. 22-ton B.L.R., 10 6-in. 89-cwt. B.L.R., 16 Q.F., 7 M., 3 l.	4	l. car.	18·5	900	8000
a.c.	**Australia** . (steel)	2 *s.*	5600	8876	22	6	300	0	56	0	Glasgow	Napier .	1889	195,390	63,000	10 *comp.*	16 *comp.*	12 conning tower.	6	2	9·2-in. 22-ton B.L.R., 10 6-in. 5-ton B.L.R., 16 Q.F., 7 M., 3 l.	4 2	l. car. f. tu.	18·5	900	8000
c.b.	**Belleisle** (iron) (was "Payki-Sherreef").	2 *s.*	4870	3200	21	0	245	0	52	0	Poplar .	Maudslay . .	1878	240,000 (purchased)		12,10, 8,6	9,6,5	9 conning tower.	16 & 9	4	25-ton M.L.R., 6 Q.F., 9 M., 2 l.	2	l. car.	12·20	510	1824
c.b.	**Bellerophon** (iron)		7550	6520	26	7	300	0	56	1	Chatham	Penn .	1866	235,738	86,963	6	5	8 pilot tower.	10	10	8-in. 14-ton B.L.R., 4 6-in. 89-cwt. do., 6 4-in. 22-cwt. do., 4 Q.F., 12 M., 4 l.	2	l. car.	14·17	650	1610
b.	**Benbow** (steel)	2 *s.*	10,600	11,500	28	4	330	0	68	6	Blackwall	Maudslay .	1888	*x* 650,820	*y* 110,000	18 *comp.*	16 *comp.*	14 & 12 on barbette *comp.*	12to15	2	111-ton B.L.R., 10 6-in. do., 15 Q.F., 6 M., 2 l.	1 4	f. tu. l. car.	16·75 By log.	1200	7100
br.	**Black Prince** . (iron)		9210	5770	26	10	380	2	58	4	Glasgow .	Penn .	1862	283,154	74,482	4½	4½	..	18to10	4	9-ton M.L.R., 22 6½-ton do., 2 6-in. 89-cwt. B.L.R., 4 Q.F., 7 M., 8 l.	2	l. car.	13·60	750	1080
b.	**Camperdown** (steel)	2 *s.*	10,600	11,500	27	3	330	0	68	6	Portsm'th	Maudslay .	1889	*x* and *y* 769,456		18 *comp.*	16 *comp.*	12to14 on barbette *comp.*	10to15	4	67-ton B.L.R., 6 6-in. do., 19 Q.F., 7 M., 2 l.	1 4	f. tu. l. car.	16·75	1200	7100
b.	**Collingwood** (steel)	2 *s.*	9500	9570	26	10	325	0	68	0	Pembroke	Humphrys	1886	*x* 520,000	*y* 104,000	18 *comp.*	16 *comp.*	12to14 on barbette	17to10	4	45-ton B.L.R., 6 6-in. do., 15 Q.F., 11 M., 2 l.	4	l. car.	16·50	1200	8500
t.	**Colossus** (steel)	2 *s.*	9420	7500	26	3	325	0	68	0	Portsm'th	Maudslay .	1886	533,000	113,786	18 & 14	16 & 13	16 & 14 turret.	22to10	4	45-ton B.L.R., 5 6-in. 5-ton do., 4 Q.F., 15 M., 4 l.	2	l. car.	15·50	970	6200
t.	**Conqueror**. (steel)	2 *s.*	6200	6000	24	0	270	0	58	0	Chatham	Humphrys	1882	325,000	93,433	12to8½	11½ to 10½	12 turret & conning tower.	10 to 13½ on sides, 9 on bulkheads.	2	45-ton B.L.R., 4 6-in. 89-cwt. do., 6 Q.F., 12 M., 2 l.	6	l. car.	15·50	650	5200

x Includes Hydraulic Machinery, Gun Mountings, &c. *y* Propelling Machinery.

GREAT BRITAIN.—Armoured Ships—*continued.*

a.c., armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *br.*, broadside ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t*, turret-ship; 2 *s.*, two screws.

M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; l., light guns under 15 cwt., including boats' guns; Q.F., quick-firing gun; M., machine guns; *comp.*, compound or steel-faced armour; f. tu., l. car., fixed tube or launching carriage for Whitehead torpedo discharge.

Class.	NAME.	Displacement.	Indicated Horse-Power.	Draught of Water. Extreme.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Completion.	Cost.		Armour.			Backing.	Armament.		Speed.	Coal Endurance.	
										Hull.	Machinery.	Side.	Bulk-head.	Turret.		Guns.	Fish Torpedo Dischargers.		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
		tons.		ft. in.	ft. in.	ft. in.				£	£	in.	in.	in.	in.			knots.	tons.	knots.
c.s., *t.*	**Cyclops** (iron) 2 *s.*	3560	1660	16 4	225 0	45 0	Blackwall	Elder .	1871	136,426	17,600	8 & 6	9 & 8 in breastwork.	9 & 10	9 & 11	4 18-ton M.L.R., 4 Q.F., 5 M., 1 l.	..	11·0	250	1920
br.	**Defence** (iron) (Non-effective in Navy List)	6270	2540	26 7	280 0	54 2	Jarrow .	Penn .	1862	197,879	34,357	4½	4½	..	18	2 9-ton M.L.R., 14 6½-ton do., 6 M., 4 l.	..	11·62	450	1100
t.	**Devastation** 2 *s.* (iron)	9330	6650	27 6	285 0	62 3	Portsm'th	Penn .	1873	290,660	63,188	12 & 10	12 & 10 breastwork.	14 & 12	18 to 16	4 35-ton M.L.R., 6 Q.F., 12 M., 2 l.	2 l. car.	13·84	1800	5980
t.	**Dreadnought** 2 *s.* (iron)	10,820	8210	26 9	320 0	63 10	Pembroke	Humphrys	1875	485,573	107,000	14,12, 11	13	14	18 to 15	4 38-ton M.L.R., 6 Q.F., 16 M., 2 l.	2 f. tu. 2 l. car.	14·20	1330	5720
t.	**Edinburgh** . 2 *s.* (steel)	9420	7500	26 3	325 0	68 0	Pembroke	Humphrys	1886	*x* 555,333	*y* 87,000	18 & 14	16 & 13	16 & 14	22 to 10	4 45-ton B.L.R., 5 6-in. 5-ton do., 7 Q.F., 13 M., 2 l.	2 l. car.	15·50	970	6200
a.c.	**Galatea** (steel) 2 *s.*	5600	8500	22 6	300 0	56 0	Glasgow .	Napier	1889	*x* 195,390	*y* 63,000	10 *comp.*	16 *comp.*	12 conning tower.	6	2 9·2-in. 24-ton B.L.R., 10 6-in. 5-ton do., 16 Q.F., 7 M., 3 l.	4 l. car. 2 f. tu.	18·5	900	8000
c.s., *t.*	**Glatton** (iron) 2 *s.*	4910	2870	19 5	245 0	54 0	Chatham	Laird .	1872	189,133	30,396	12 to 10	12 breast-work.	14 & 12	20 to 15	2 25-ton M.L.R., 3 Q.F., 4 M., 2 l.	2 sub. f. tu.	12·11	540	2000
c.s., *t.*	**Gorgon** (iron) 2 *s.*	3560	1670	16 4	225 0	45 0	Jarrow	Ravenhill	1872	122,904	15,663	8 & 6	9 & 8 breast-work.	9 & 10	11 to 9	4 18-ton M.L.R., 4 Q.F., 5 M., 2 l.	..	11·14	270	1230

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c.s., t.	**Hecate** (iron)	2 *s.*	3560	1750	16	4	225	0	45	0	Poplar	Ravenhill	1872	124,906	15,687	8 & 6	9 & 8 breast-work.	9 & 10	11 to 9	4	18-ton M.L.R., 4 Q.F., 4 M., 1 l.	..	10·90	270	1230
br.	**Hector** . (iron)		6710	3260	26	0	280	2	56	5	Glasgow	Napier .	1864	237,438	45,764	4½	4½	..	18	2	9-ton M.L.R., 16 6½-in. do. 8 M., 5 l.	..	12·36	460	1460
a.b.	**Hercules** (iron)		8680	6750	26	6	325	0	59	0½	Chatham	Penn .	1868	278,320	82,814	9 to 6	6 & 5	..	12 & 10	8	18-ton M.L.R., 2 12½-t. do., 4 7-in. 6½-ton do., 6 4-in. 22-cwt. B.L.R., 7 Q.F., 12 M., 3 l.	4 l. car.	14·00	610	1760
t.	**Hero** (steel)	2 *s.*	6200	6000	24	0	270	0	58	0	Chatham	Rennie .	1887	*x* 338,971	*y* 58,300	12 *comp.*	11½ *comp.*	12 *comp.*	13½	2	45-ton B. L. R., 4 6-in. 5-ton do., 12 Q.F., 6 M., 2 l.	6 l. car.	15·5	620	5200
c.s., t.	**Hotspur** (iron)	2 *s.*	4010	3060	21	10	235	0	50	0	Glasgow .	Napier .	1871	135,067	36,461	11 & 8	8 breast-work.	10 & 8½	15 to 12 on side 10 on turret.	2	25-ton M.L.R., 2 6-in. 81-cwt. B.L.R., 4 Q.F., 9 M., 2 l.	2 l. car.	12·8	300	920
b.	**Howe** (steel)	2 *s.*	10,300	11,500	27	3	325	0	68	0	Pembroke	Humphrys	1887	*x* 560,469	*y* 106,553	18 *comp.*	16 *comp.*	11½ to 10 on bar-bette.	15 to 12	4	67-ton B.L.R., 6 6-in. 5-ton do., 19 Q.F., 7 M., 2 l.	1 f. tu. 4 l. car.	16·75	1200	7200
c.s., t.	**Hydra** (iron)	2 *s.*	3560	1470	16	4	225	0	45	0	Glasgow	Elder .	1872	124,454	16,918	8 & 6	9 & 8 on br	9 & 10 eastwo	11 to 9 rk.	4	18-ton M.L.R., 4 Q.F., 5 M., 2 l.	..	11·20	250	1920
a.c.	**Immortalité**. (steel)	2 *s.*	5600	8500	22	6	300	0	56	0	Chatham	Earle .	1889	*x* 221,500	*y* 57,000 Estd.	10 *comp.*	16 *comp.*	12 conning tower.	6	2	9·2-in. 22-ton B.L.R., 10 6-in. 89-cwt. do., 16 Q.F., 7 M., 3 l.	4 l. car.	18·50	900	8000
a.c.	**Impérieuse** . (steel) (Copper sheathed).	2 *s.*	8400	10,000	27	4	315	0	62	0	Portsm'th	Maudslay	1886	*x* 417,437	*y* 113,377	10 *comp.*	9 *comp.*	8 *comp.* on bar-bette.	10	4	9·2-in. 24-ton B.L.R., 6 6-in. 89-cwt. do., 8 Q.F., 9 M., 2 l.	2 f. tu. 4 l. car.	16·75	1130	7000
t.	**Inflexible** (iron)	2 *s.*	11,880	8010	26	4	320	0	75	0	Portsm'th	Elder .	1881	648,811	146,457	24, 20, 16	22, 18, 14	17 & 16 *comp.*	17 to 25	4	80-ton M.L.R., 8·4-in. 22-cwt. B.L.R., 5 Q.F., 15 M., 2 l.	2 f. tu. sub. 2 l. car.	13·80	1300	5200

x Includes Hydraulic Machinery, Gun Mountings, &c. *y* Propelling Machinery. *z* New Main Armament will be 4 10-in. 29-ton B.L.R. guns.

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GREAT BRITAIN.—Armoured Ships—*continued.*

a.c, armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *br.*, broadside ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t*, turret-ship; 2 *s.*, two screws.

M.L.R., muzzle-loading rifled gun; B.L.R. breech-loading rifled gun; l., light guns under 15 cwt., including boats' guns: Q.F., quick-firing gun; M., machine guns; *comp.*, compound or steel-faced armour; f. tu., l. car., fixed tube or launching carriage for Whitehead torpedo discharge.

Class	NAME.	Displacement.	Indicated Horse-Power.	Draught of Water. Extreme.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Completion.	Cost.		Armour.			Wood Backing.	Armament.		Speed.	Coal Endurance.	
										Hull.	Machinery.	Side.	Bulkhead.	Turret.		Guns.	Fish Torpedo Dischargers.		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
		tons.		ft. in.	ft. in.	ft. in.				£	£	in.	in.	in.	in.			knots.	tons.	knots.
c.b.	**Invincible** . 2 *s.* (iron)	6010	4830	23 2	280 0	54 0	Glasgow	Napier	1870	187,055	52,386	8 to 6		..	10	10 12-ton M.L.R., 6·4-in. 22-cwt. B.L., 4 Q.F., 15 M., 4 l.	4 l. car.	14·09	500	1580
c.b.	**Iron Duke** . 2 *s.* (iron)	6010	3520 forced & reduced boilers.	23 3	280 0	54 0	Pembroke	Ravenhill	1871	146,314	50,165	8 to 6	5	..	10	10 12-ton M.L.R., 4 5-in. 38-cwt. B.L.R., 4 Q.F., 14 M., 4 l.	4 l. car.	13·64	700	3900
br.	**Minotaur** (iron)	10,690	6700	27 3	400 0	59 4½	Blackwall	Penn	1867	377,325	79,505	5½	4½	..	10	17 12-ton M.L.R., 14 M., 14 l.	2 l. car.	14·41	750	1200
t.	**Monarch** (iron)	8320	7840	26 7	330 0	57 6	Chatham	Humphrys	1869	279,903	74,672	7 to 6	5 & 4½	10 & 8	12	4 25-ton M.L.R., 2 12-ton M.L.R., 1 6½-ton M.L.R., 4 Q.F., 14 M., 3 l.	2 l. car.	14·94	630	1500
a.c.	**Narcissus** . 2 *s.* (steel)	5600	8500	22 6	300 0	56 0	Hull	Earle	1889	*x* 195,890	*y* 61,500	10 *comp.*	16 *comp.*	12 conning tower.	6	2 9·2-in. 22-ton B.L.R., 10 6-in. 5-ton B.L.R., 16 Q.F., 7 M., 3 l.	4 l. car. 2 f tu.	18·50	900	8000
a.c.	**Nelson** (iron) 2 *s.* (Zinc sheathed.)	7630	6640	26 6	280 0	60 0	Glasgow	Elder	1880	303,310	87,545	9 & 6	9,8,6	9 conning tower.	13 to 10	4 18-ton M.L.R., 8 12-ton M.L.R., 4 4·7-in. Q.F., 16 Q.F. 6 M., 3 l.	2 l. car.	14·41	1150	5200
t.	**Neptune** (iron) (Copper sheathed; was "Independencia.")	9310	8000	26 1	300 0	63 0	Poplar	Penn	1878	600,000 (purchased).		12 to 9	8 & 6	11 & 13	11 to 13	4 38-ton M.L.R., 2 12-ton M.L.R., 14 Q.F., 10 M., 2 l.	2 l. car.	14·20	670	1480

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t.	**Nile** (steel) 2 *s.*	11,940	12,000	27	6	345	0	73	0	Pembroke	Maudslay	1888	765,794 *x*	98,000 *y*	20 to 16	18 to 14	18	6	4	67-ton B.L.R., 6 4·7-in. Q.F., 8 6-pdr. do., 9 3-pdr. do., 4 M.	6 f. tu. 2 l. car.	16·50	1200	6500
a.c.	**Northampton** (iron) (Zinc sheathed.) 2 *s.*	7630	6070	25	9	280	0	60	0	Glasgow	Penn	1878	296,836	98,968	9 & 6	9, 8, 6	9 conning tower.	13, 10	4	18-ton M.L.R., 8 12-ton M.L.R., 18 Q.F., (4 being 4·7-in.) 10 M., 3 l.	2 l. car.	13·20	1150	3850
br.	**Northumberland** (iron)	10,780	6560	27	1	400	4	59	5	Millwall	Penn	1868	391,481	79,871	5½	4½	5½ conning tower.	10	7	12-ton M.L.R., 20 9-ton do., 1 6-in. 89-cwt. B.L.R., 1 5-in. 40-cwt. do., 4 Q.F., 11 M., 12 l.	4 l. car.	14·13	756	1270
c.b.	**Orion** (iron) 2 *s.* (was "Boordji-Zaffer")	4870	4040	21	4	245	0	52	0	Poplar	Maudslay	1882	239,270	52,959	12, 10, 8, 7	9, 6, 5	9 conning tower.	16 & 9	4	25 ton M.L.R., 6 Q.F., 8 M., 2 l.	4 l. car.	13·0	520	1830
a.c.	**Orlando** (steel) 2 *s.*	5600	8500	22	6	300	0	56	0	Jarrow	Palmer	1888	206,647 *x*	60,165 *y*	10 *comp.*	16 *comp.*	12 conning tower.	6	2	9·2 in. 22-ton B.L.R., 10 6-in. 5-ton do., 16 Q.F., 7 M., 3 l.	4 l. car. 2 f. tu.	18·5	900	8000
c.b.	**Penelope** (iron) 2 *s.*	4470	4700	17	6	260	0	50	0	Pembroke	Maudslay	1868	145,993	40,855	6 & 5	4½	..	10 & 11	8	9-ton M.L.R., 2 20-pdr. B.L.R., 4 Q.F., 11 M., 2 l.	..	12·76	470	1360
c.s., t.	**Prince Albert** (iron) .	3880	2130	20	4	240	0	48	1	Poplar	Humphrys	1866	178,537	24,129	4½	..	10 & 5½	18	4	12-ton M.L.R., 6 M., 2 l.	..	11·65	230	930
c.b.	**Repulse** (wood) (In Navy List marked for sale)	6190	3350	26	2	252	0	57	1½	Woolwich	Penn	1870	156,246	27,394	6	4½	..	31	12	9-ton M.L.R., 8 M., 9 l.	2 l. car.	12·28	500	1700
b.	**Rodney** (steel) 2 *s.*	10,300	11,500	27	3	325	0	68	0	Chatham	Humphrys	1887	563,878 *x*	105,400 *y*	18 *comp.*	16 *comp.*	11½ to 10 on barbette	15 to 12	1	69-ton B.L.R., 3 67-ton do., 6 6-in. 5-ton do., 14 Q.F., 10 M., 2 l.	4 l. car.	16·75	1200	8500
c.s., t.	**Rupert** (iron) 2 *s.*	5440	4630	23	7	250	0	53	0	Chatham	Napier	1874	193,171	39,506	11 & 9	12 breast-work.	14 & 12	14 & 10	2	18-ton M.L.R., 2 6-in. 89-cwt. B.L.R., 4 Q.F., 8 M., 2 l.	4 l. car.	13·59	480	1340

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GREAT BRITAIN.—Armoured Ships—*continued.*

a.c., armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *br.*, broadside ship; *c.b.*, central battery ship; *c.s.*, coast-service vessel; *t.*, turret-ship; 2 *s.*, two screws.

M.L.R., muzzle-loading rifled gun: B.L.R., breech-loading rifled gun; l., light guns under 15 cwt., including boats' guns; Q.F., quick-firing gun; M., machine guns; *comp.*, compound or steel-faced armour; f. tu., l. car., fixed tube or launching carriage for Whitehead torpedo discharge.

Class.	NAME.	Displacement.	Indicated Horse-Power.	Draught of Water. Extreme.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Completion.	Cost.		Armour			Backing.	Armament.		Speed.	Coal Endurance.	
										Hull.	Machinery.	Side.	Bulkhead.	Turret.		Guns.	Fish Torpedo Dischargers.		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
		tons.		ft. in.	ft. in.	ft. in.				£	£	in.	in.	in.	in.			knots.	tons.	knots.
t.	**Sans Pareil** . 2 *s.* (steel)	10,470	14,000	27 3	340 0	70 0	Blackwall	Humphrys	1889	*x* 609,109	*y* 110,333	16 to 18 *comp.*	16	18 *comp.*	6	2 111-ton B.L.R., 1 10-in. 29-ton do., 12 6-in. 5-ton do., 21 Q.F., 8 M. 2 l.	6 f. tu. 2 l. car.	16·75	1200	7000
c.s., *t.*	**Scorpion** (iron)	2750	1450	16 11	224 6	42 4½	Birkenh'd	Laird	1865	92,033	18,540	4½	..	5	10 to 8	4 12-ton M.L.R., 6 M., 1 l.	..	10·51	320	1210
a.c.	**Shannon** (iron) (Zinc sheathed.)	5390	3370	23 4	260 0	54 0	Pembroke	Laird	1877	233,902	53,367	9, 8, 6	9 & 8	9 conning tower.	10 & 12	2 18-ton M.L.R., 7 12-ton do., 10 M., 8 l.	2 l. car.	12·35	580	2260
c.b.	**Sultan** . (iron) (At present sunk in the Malta Channel)	9290	7720	27 6	325 0	59 0½	Chatham	Penn	1871	281,373	76,042	9, 8, 6	6 to 4½	..	12 & 10	8 18-ton M.L.R., 4 12½-ton M.L.R., 7 4-in. 22-cwt. B.L.R., 4 Q.F., 13 M. 4 l.	4 l. car.	14·13	810	2140
c.b.	**Superb** . (iron) (was "Hamidyeh")	9170	6580	26 5	332 3	59 0	Blackwall	Maudslay	1880	443,000 (purchased)		12, 10, 7	10, 7, 6 5	8 on conning tower.	7 to 12	16 18-ton M.L.R., 6 4-in. 22-cwt. B.L., 14 Q.F., 6 M., 3 l.	4 l. car.	13·50	970	1810
c.b.	**Swiftsure** (iron) (Copper sheathed.)	6910	4910	26 0	280 0	55 0	Jarrow	Maudslay	1872	207,940	49,141	8 to 6	6, 5, 4	..	10	10 12-ton M.L.R., 8 4-in. 22-cwt. B.L., 8 Q.F., 11 M., 2 l.	4 l. car.	13·75	540	1630

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c.b. & b.	**Temeraire** (iron) (Zinc sheathed.)	2 *s.*	8540	7520	27	2 285	0 62	0	Chatham	Humphrys	1877	382,613	102,[illegible]	9, 8		8 after barbette			18-ton do., 6 4-in. 22-cwt. B.L.R., 6 Q.F., 13 M., 3 l.					
t.	**Thunderer** (iron)	2 *s.*	9330	6270	27	0 285	0 62	3	Pembroke	Humphrys	1877	306,084	52,458	12 & 10	12 & 10 breast-work.	14 & 12	18 to 16	2	38-ton M.L.R., 2 35-ton do., 14 Q.F., 4 M., 2 l.	2 l. car.	13·40	1600	3040
t.	**Trafalgar** (steel)	2 *s.*	11,940	12,000	27	6 345	0 73	0	Portsm'th	Humphrys	Bldg. Lchd 1887	*x* 765,794	*y* 97,000	20 to 16	18 to 14	18	6	4	67-ton B.L.R., 6 4·7-in. Q.F., 8 6-pdr. do., 9 3-pdr. do., 4 M.	6 f. tu. 2 l. car.	16·50	1200	6500
c.b.	**Triumph** (Copper sheathed.)	(iron)	6640	5110	26	2 280	0 55	0	Jarrow	Maudslay	1873	209,109	49,213	8 to 6	6, 5, 4	..	10	10	12-ton M.L.R., 4 5-in. 38-cwt. B.L.R., 16 Q.F., 4 M., 3 l.	4 l. car.	13·75	550	1680
a.c.	**Undaunted** (steel)	2 *s.*	5600	8500	22	6 300	0 56	0	Jarrow	Palmer Co.	1889	*x* 195,890	*y* 60,165	10 *comp.*	16 *comp.*	12 conning tower.	6	2	9·2-in. 22-ton B.L.R., 10 6-in. 5-ton do., 16 Q.F., 7 M., 3 l.	4 l. car. 2 f. tu.	18·5	900	8000
br.	**Valiant**	(iron)	6710	3350	26	8 280	2 56	4	Poplar	Maudslay	1865	271,964	48,324	4½	4½	..	18	2	9-ton M.L.R., 16 6½-ton do., 8 M., 4 l.	..	12·65	450	1430
t.	**Victoria** (steel) (was "Renown").	2 *s.*	10,470	14,000	27	3 340	0 70	0	Newcastle	Humphrys	1889	612,522	112,333	16 to 18 *comp.*	16	18 *comp.*	6	2	111-ton B.L.R., 1 29-ton do., 12 6-in. 5-ton do., 21 Q.F., 8 M., 2 l.	6 f. tu. 2 l. car.	16·75	1200	7000
a.g. b.	**Viper** (iron)	2 *s.*	1230	700	11	8 160	0 32	0	Poplar	Maudslay	1867	43,517	7,610	4½	4½	..	10	2	6½-ton M.L.R., 2 l.	..	9·59	110	..
a.g. b.	**Vixen** (Composite.)	2 *s.*	1230	740	11	8 160	0 32	5	Deptford Green	Maudslay	1866	46,333	7,860	4½	4½	..	10	2	6½-ton M.L.R., 2 l.	..	8·89	110	..
br.	**Warrior**	(iron)	9210	5270	26	9 380	2 58	4	Blackwall	Penn	1861	282,284	74,409	4½	4½	..	18 to 10	4	9-ton M.L.R., 28 6½ do., 8 M., 4 l.	..	14·40	790	1210
a.c.	**Warspite** (Copper sheathed.)	2 *s.*	8400	10,000	27	4 315	0 62	0	Chatham	Penn	1886	*x* 415,546	*y* 113,786	10 *comp.*	9 *comp.*	8 barbette.	10	4	9·2 in. 22-ton B.L.R., 6 6-in. 89-cwt. do., 8 Q.F., 10 M., 3 l.	2 f. tu. 4 l. car.	16·75	1130	7000
c.s., t.	**Wivern**	(iron)	2750	1450	17	0 224	6 42	4	Birkenh'd	Laird	1865	98,118	18,396	4½	..	5	8 to 10	4	12-ton M.L.R., 8 M., 1 l.	..	10·06	300	1150

x Includes Hydraulic Machinery, Gun Mountings, &c.

y Propelling Machinery.

z New Main Armament will be 4 10-in. 29-ton B.L.R.

GREAT BRITAIN.—Armoured Ships—*continued.*

u.c., armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *br.*, broadside ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t.*, turret-ship; 2 *s.*, two screws.

M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; l., light guns under 15 cwt., including boats' guns; Q.F., quick-firing gun; M., machine gun; *comp.*, compound or steel-faced armour; f. tu., l. car., fixed tube or launching carriage for Whitehead torpedo discharge.

Class.	NAME.	Displacement.	Indicated Horse-Power.	Draught of Water. Extreme.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Completion.	Cost.		Armour.			Backing.	Armament.		Speed.	Coal Endurance.	
										Hull.	Machinery.	Side.	Bulk-head.	Turret.		Guns.	Fish Torpedo Dischargers.		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
		tons.		ft. in	ft. in.	ft. in.				£	£	in.	in.	in.	in.			knots.	tons.	knots.
t.	Armoured 1st class Battle ship, (No. 1) (steel) 2 *s.*	14,150	13,000	27 6	380 0	75 0	Chatham.	..	1893 estd.	..	..	18	..	..	..	4 67-ton B.L.R., 10 6-in. Q.F., and 18 other Q.F.	..	17·5	900	5000
b.	Do. (No. 2) (steel) 2 *s.*	14,150	13,000	27 6	380 0	75 0	Portsm'th	..	1893 estd.	..	..	18	..	..	..	4 67-ton B.L.R., 10 6-in. Q.F., and 24 other Q.F.	..	17·5	900	5000
b.	Do. (No. 3) (steel) 2 *s.*	14,150	13,000	27 6	380 0	75 0	Pembroke	..	1893 estd.	..	..	18	..	..	..	4 67-ton B.L.R., 10 6-in. Q.F., and 24 other Q.F.	..	17·5	900	5000
b.	Do. (No. 4) (steel) 2 *s.*	14,150	13,000	27 6	380 0	75 0	Pembroke	..	1893 estd.	..	..	18	..	..	..	4 67-ton B.L.R., 10 6-in. Q.F., and 24 other Q.F.	..	17·5	900	5000
	Armoured 2nd class Battle ship	Design not yet decided					Portsm'th	..	..	..	..	..	..	..	..	.. ..	..	..	..	..
The following which appear in the Official Navy List belong to India and Australia:—																				
c.s., *t.*	Abyssinia*(iron) 2 *s.* (*Indian Marine.*)	2900	950	14 6	225 0	42 0	Poplar	Dudgeon	1870	97,049	19,500	7 & 6	On breast-work. 8 & 7 Do.	10 & 8	11 to 9	4 18-ton M.L.R., 2 M., 2 l.	..	9·59	92	..
c.s., *t.*	Cerberus† (iron) 2 *s.* (*Colonial Marine.*)	3480	1370	15 3	225 0	45 0	Jarrow	Maudslay	1870	99,331	18,225	8 to 6	9 to 8 Do.	10 & 9	11 to 9	4 18-ton M.L.R., 4 M., 2 l.	..	9·75	120	..
c.s. *t.*	Magdala‡ (iron) 2 *s.* (*Indian Marine.*)	3340	1440	15 3	225 0	45 0	Blackwall	Ravenhill	1870	115,400	17,000	8 to 6	9 to 8	10 & 9	11 to 9	4 18-ton M.L.R., 4 M.	..	10·67	120	..

* At Bombay. † At Melbourne, Va. ‡ At Bombay.

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For the armoured ships to be added to H. M. Navy and those removed therefrom between the 1st of April, 1889 and 1st of April, 1894, see Parliamentary Returns at pages 155 and 622.

The names of most of the following armoured ships do not now appear in the Navy List, the ships having been disposed of by sale or otherwise:—

Cruisers.		Tons Displacement.	I.HP.	
Caledonia	(wood)	6,830	4,540	
Enterprise	(wood)	1,350	690	
Favorite	„	3,230	1,770	
Lord Clyde	„	7,840	6,064	
Lord Warden (in the Navy List as Non-Effective)	„	7,840	6,700	(to be sold)
Pallas	„	3,790	3,580	
Research	„	1,740	1,040	
Resistance (used as a torpedo target ship)	(iron)	6,270	2,430	
Royal Alfred	(wood)	6,700	3,430	
Royal Oak	„	6,730	3,700	
Waterwitch (hydraulic propeller) still on the list of non-effective ships	(iron)	1,280	780	
Zealous	(wood)	6,100	3,450	

No new armoured ship was laid down for the British Government either in Royal Dockyards or at contractors' premises during the year 1888.

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GREAT BRITAIN.—Unarmoured Cruising Ships, &c.

comp., composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; Q.F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns; f. tu., fixed torpedo-tube; b. tu., bow do.; l. car., launching torpedo carriage; P., deck protected throughout; pp., deck protected amidships. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Dischargers		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
			Tons.		ft. in.	ft. in.	ft. in.				£	£			knots.	tons.	knots.
Sloop . .	Acorn . .	*Comp.*	970	1380	14 0	167 0	32 0	Milford Haven	Maudslay.	1884	27,500	14,500	8 5-in. 38-cwt. B.L.R., 8 M., 1 l.	..	12·2	150	1900
Corvette . .	Active . .	Iron wood and copper sheathed	3080	4130	21 4	270 0	42 0	Blackwall	Humphrys	1869	85,795	40,361	10 6-in. 81-cwt. B.L.R., 2 64-pdrs. M.L.R., 9 M., 2 l.	2 l. car.	15·10	410	2000
Desp. Vessel .	Alacrity . 2 *s.*	Steel.	1700	3180	14 0	250 0	32 6	Jarrow .	Palmer .	1885	*x* 48,289	*y* 29,680	4 5-in. 38-cwt. B.L.R., 4 6-pdr. Q.F., 2 M.	..	17·00	400	6450
Gun Boat . . (2nd class)	Albacore . .	*Comp.*	560	660	10 6	135 0	26 0	Birkenh'd	Laird .	1883	18,000	8,500	2 5-in. 38-cwt. B.L.R., 2 4-in. 22-cwt. do., 2 M.	..	11·0	85	..
Gun Vessel .	Algerine . .	*Comp.*	835	810	13 7	157 0	29 6	Belfast .	Laird .	1880	25,896	10,556	2 64-pr. M.L.R., 2 5-in. 40-cwt. B.L.R., 4 M., 1 l.	..	10·50	110	1100
Cruiser pp. (2nd class)	Amphion . 2 *s.*	Steel	4300	5550	20 6	300 0	46 0	Pembroke	Maudslay .	1883	95,000	65,500	10 6-in. 5-ton B.L.R., 4 Q.F., 12 M., 2 l.	4 l. car.	17·00	1000	11,000
Gun Vessel .	Arab (to be sold).	*Comp.*	720	660	13 9	150 0	28 6	Glasgow .	Napier .	1874	25,041	9,982	1 90-cwt. M.L.R., 1 64-pdr. do., 2 20-pdr. B.L.R., 2 M., 1 l.	..	10·26	70	790
Torpedo Cruiser.	Archer . 2 *s.*	Steel	1770	4122	14 6	225 0	36 0	Glasgow .	Thomson .	1886	*x* 55,916	*y* 31,667	6 6-in. 5-ton B.L.R., 8 3-pr. Q.F., 2 M., 1 l.	1 f. tu. 4 l. car.	17·80	475	7000
Cruiser pp. (2nd class)	Arethusa . 2 *s.*	Steel	4300	5500	20 6	300 0	46 0	Glasgow .	Napier .	1882	86,763	58,435	10 6-in. 89-cwt. B.L.R., 4 Q.F., 12 M., 2 l.	4 l. car.	17·00	1000	11,000
Gun Vessel .	Avon . 2 *s.*	*Comp.*	608	530	9 7	155 0	25 0	Portsm'th	Maudslay .	1867	16,547	5,797	1 90-cwt. M.L.R., 1 64-pdr. do., 2 20-pdr. do., 2 M.	..	10·34	90	..

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Corvette		Bacchante			Iron wood and zinc sheathed	4130	5420	23	9	280	0	45	6	Portsm'th	Rennie		1876	152,454	76,954	4	6-in. B.L.R., 10 90-cwt. M.L.R., 12 M., 8 l.	2 l. car.	15·00	570	4070
Gun Boat (2nd class)		Banterer			*Comp.*	465	440	10	0	125	0	23	6	Barrow	Barrow		1880	15,600	5,300	2	64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·8	40	..
																		Total.						
Cruiser (3rd class)	P.	Barham		2 *s.*	Steel	1830	6000	13	3	280	0	35	0	Portsm'th	Hawthorn		Bldg.	87,200		6	4·7-in. Q.F., 4 3-pdr. Q.F., 2 M.	2 f. tu. or l.car	19·5	140	2600
„	„ P.	Barracouta		2 *s.*	..	1580	3000	14	0	220	0	35	0	Sheerness	Palmer		Bldg.	80,000		6	4·7-in. Q.F., 4 3-pdr. Q.F., 2 M.	2 f. tu. or l.car	16·5	160	3400
„	„ P.	Barrosa		2 *s.*	..	1580	3000	14	0	220	0	35	0	Portsm'th	Palmer		Bldg.	77,600		6	4·7-in. Q.F., 4 3-pdr. Q.F., 2 M.	2 f. tu. or l.car	16·5	160	3400
Sloop		Basilisk		2 *s.*	Steel and wood flanked	1170	2000	12	6	195	0	28	0	Sheerness	Rennie		Bldg.	58,000		8	5-in. 40-cwt., B.L.R., 8 M.	..	14·5	160	3000
„		Beagle		2 *s.*	Steel and wood sheathed	1170	2000	12	6	195	0	28	0	Portsm'th	Rennie		Bldg.	55,500		8	5-in. 40-cwt., B.L.R., 8 M.	..	14·5	160	3000
Cruiser (3rd class)	P.	Bellona		2 *s.*	Steel	1830	6000	28	0	35	0	13	3	Newcastle	Hawthorn		Bldg.	86,000		6	36-pdr. Q.F., 4 3-pdr. do., 2 M.	2 f. tu. or l.car	19·5	140	2600
Cruiser (1st class)		Blake		2 *s.*	Steel	9000	20,000	25	9	375	0	65	0	Chatham	Maudslay		Bldg.	368,000		2	9·2-in. 22-ton B.L.R., 10 6-in. 5-ton Q.F., 18 3-pdr. Q.F.	4 f. tu. or l.car	22·0	1500	15,000
Cruiser (3rd class)	P.	Blanche		2 *s.*	..	1580	3000	14	0	220	0	35	0	Pembroke	Earle		Bldg.	80,000		6	4·7-in. Q.F., 4 3-pdr. Q.F., 2 M.	2 f. tu. or l.car	16·5	160	3400
Cruiser (1st class)		Blenheim		2 *s.*	Steel	9000	20,000	25	9	375	0	65	0	Thames Ironworks	..		Bldg.	..	..	2	9·2-in. 22-ton B.L.R., 10 6-in. Q.F., 18 3-pdr. Q.F.	4 f. tu. or l.car	22·0	1500	15,000
Cruiser (3rd class)	P.	Blonde		2 *s.*	..	1580	3000	14	0	220	0	35	0	Pembroke	Earle		Bldg.	80,000		6	4·7-in. Q.F., 4 3-pdr. Q.F., 2 M.	2 f. tu. or l.car	16·5	160	3400
Corvette		Boadicea			Iron wood and copper sheathed	4140	5130	23	8	280	0	45	0	Portsm'th	Rennie		1875	153,167	70,409	2	6-in. 81-cwt. B.L.R., 12 90-cwt. M.L.R., 6 Q.F., 11 M., 2 l.	2 l. car.	14·70	570	3000
Gun Boat (1st class)		Bramble		2 *s.*	*Comp.*	715	1000	11	0	165	0	29	0	Belfast	Harland		1886	39,835	10,000	6	4-in. 25-cwt. B.L.R., 4 M.	..	13·0	105	2500
Torpedo Cruiser		Brisk		2 *s.*	Steel	1770	3500	14	3½	225	0	36	0	Glasgow	Thomson		1886	55,916	31,667	6	6-in. 5-ton B.L.R., 8 3-pdr. Q.F., 2 M., 1 l.	1 f. tu. 4 l. car.	17·00	325	4850

z Includes Gun Mountings, &c.

y Propelling Machinery.

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GREAT BRITAIN.—Unarmoured Cruising Ships, &c.—*continued.*

comp., composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun: Q.F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns; f. tu. or b. tu., fixed or bow torpedo tube; l. car., launching torpedo carriage; P., deck protected; pp., partial deck protected. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Dischargers		Coal that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
			Tons.		ft. in.	ft. in.	ft. in.				£	£			knots.	tons.	knots.
Gun Boat . . (2nd class)	**Bullfrog** . 1 *s.*	*Comp.*	465	420	9 6	125 0	23 6	Pembroke	Maudslay .	1881	16,300	6,050	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·8	40	..
Gun Vessel .	**Buzzard** . 2 *s.*	*Comp.*	1140	2000	11 6	195 0	28 0	Sheerness	Barrow .	1887	*x* 42,500	*y* 16,200	8 5-in. 40-cwt. B.L.R. guns, 8 M.	..	14·50	160	3000
Cruiser . pp. (3rd class)	**Calliope** . .	Steel wood & copper sheathed	2770	4020	19 11	235 0	44 6	Portsm'th	Rennie .	1884	82,000	38,000	4 6-in. 5-ton B.L.R., 12 5-in. 38-cwt. do., 10 M., 2 l.	2 l. car.	13·75	550	4000
„ „ .	**Calypso** . .	Steel Do.	2770	3720	19 11	235 0	44 6	Chatham	Rennie .	1883	82,000	37,500	4 6-in. 5-ton B.L.R., 12 5-in. 38-cwt. do., 10 M., 2 l.	2 l. car.	13·75	550	4000
„ „ .	**Canada** . .	Steel Do.	2380	2430	19 1	225 0	44 6	Portsm'th	Rennie .	1881	78,000 estim'td	26,500 estim'td	10 6-in. 81-cwt. B.L.R., 6 M., 2 l.	2 l. car.	13·00	470	5400
„ „ .	**Caroline** . .	*Comp.*	1420	1440	15 9	200 0	38 0	Sheerness	Maudslay .	1882	56,000	15,000	14 5-in. 38-cwt. B.L.R., 8 M., 1 l.	..	13·10	400	6400
„ „ .	**Carysfort** . .	Steel wood & copper sheathed	2380	2400	19 3	225 0	44 6	Glasgow .	Elder .	1878	84,512	29,942	2 90-cwt. M.L.R., 12 64-pdr. do., 6 M., 2 l.	2 l. car.	12·96	470	3840
„ „ .	**Champion** . .	Steel Do.	2380	2310	19 3	225 0	44 6	Glasgow .	Elder .	1878	84,288	29,695	4 6-in. 89-cwt. B.L.R., 8 5-in. 40-cwt. do., 4 3-pdr. Q.F., 6 M., 2 l.	2 l. car.	13·00	470	3840
„ „ .	**Cleopatra** . .	Steel Do.	2380	2610	19 3	225 0	44 6	Glasgow .	Humphrys	1878	86,126	27,798	4 6-in. 89-cwt. B.L.R., 8 5-in. 40-cwt. do., 4 3-pdr. Q.F. 6 M., 2 l.	2 l. car.	13·00	470	3280
Gun Boat . . (2nd class)	**Cockchafer** .	*Comp.*	465	470	9 6	125 0	23 6	Pembroke	Maudslay .	1881	16,000	61,000	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·8	40	..
Cruiser . pp. (3rd class)	**Comus** . .	Steel wood & copper	2380	2450	19 3	225 0	44 6	Glasgow .	Elder .	1878	84,497	29,477	4 6-in. 81-cwt. B.L.R., 8 64-pdr.	2 l. car.	12·93	470	3800

				wood & copper sheathed																	
„	„	„	Constance.	Steel	Do.	2380	2590	19	3	225	0	44	6	Chatham.	Penn	1880	78,000 estim'td	32,000 estim'td	2 90-cwt. M.L.R., 12 64-pdr. do., 6 M., 2 l.	2 l. car.	13·72	470	5000
„	„	„	Cordelia	Steel	Do.	2380	2420	19	3	225	0	44	6	Portsm'th	Rennie	1881	78,000	26,500	10 6-in. 81-cwt. B.L.R., 10 M., 2 l.	2 l. car.	13·00	470	5400
Sloop			Cormorant		*Comp.*	1130	950	15	3	170	0	36	0	Chatham.	Humphrys	1877	37,630	11,587	2 90-cwt. M.L.R., 4 64-cwt., 64-pdr. M.L.R., 4 M., 1 l.	.. ..	11·31	150	1500 ..
Cruiser (3rd class)			Cossack	2 *s.*	Steel	1770	3500	14	3½	225	0	36	0	Glasgow	Thomson	1886	*x* 55,916	*y* 31,667	6 6-in. 5-ton B.L.R., 8 3-pdr. Q.F., 2 M., 1 l.	1 f. tu. 2 l. car.	17·00	325	4850
Cruiser, (3rd class)		pp.	Curaçoa		Steel wood & copper sheathed	2380	2540	19	3	225	0	44	6	Glasgow	Humphrys	1878	85,833	27,098	4 6-in. 5-ton B.L.R., 8 5-in. 40-cwt. do., 1 3-pdr. Q.F., 9 M., 2 l.	2 l. car. ..	13·00	470	3280
Gun Vessel (1st class)			Curlew	2 *s.*	Steel	950	1500	10	6	195	0	28	0	Devonp'rt	Penn	1886	*x* 37,363	*y* 12,600	1 6-in. 5-ton B.L.R., 3 5-in. 38-cwt. B.L.R., 7 M.	1 b. tu. 4 l. car.	14·5	250	10,000
Sloop			Daphne	2 *s.*	*Comp.*	1140	2000	11	6	195	0	28	0	Sheerness	Greenock F'ndry Co.	1888	*x* 42,400	*y* 15,200	8 5-inch 40-cwt. B.L.R., 8 M.	..	14·5	160	..
Sloop			Daring (non-effective)		*Comp.*	940	920	14	7	160	0	31	4	Blackwall	Penn	1874	30,023	9,590	2 90-cwt. M.L.R.; 2 64-pdr. do., 4 M., 1 l.	..	10·64	100	1000
[illegible] Vessel			Dart		Wood	470	200	11	6	133	0	25	2	Barrow	Barrow	..	Purchased 9,900	..	2 M., 2 l.	..	..	64	..
Surveying V			Diamond		Wood	1970	2140	18	0	220	0	37	0	Sheerness	Hawthorn	1874	50,607	26,189	12 64-pdr. M.L.R., 6 M., 2 l.	..	12·56	270	2060
Cruiser (3rd class)			[illegible]		*Comp.*	925	720	14	0	157	0	32	0	Middl'sbro	Hawthorn	1882	25,850	9,800	2 6-in. 81-cwt. B.L.R., 2 5-in. 36-cwt. B.L.R., 3 M., 1 l.	..	11·30	135	1700
Sloop			Dolphin	2 *s.*	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
„			Dragon		*Comp.*	1130	1010	15	6	170	0	36	0	Devonp'rt	Maudslay	1878	36,427	13,069	2 90-cwt. M.L.R., 4 64-pdr. do., 4 M., 1 l.	..	11·52	150	1480
Sloop			Egeria (Surveying Service).		*Comp.*	940	1010	14	3	160	0	31	4	Pembroke	Humphrys	1873	32,468	10,414	4 20-pdr. B.L.R., 2 M., 1 l.	..	11·30	100	1000
Gun Vessel			Elk	2 *s.*	*Comp.*	603	470	8	9	155	0	25	0	Portsm'th	Penn	1868	16,107	5,775	1 90-cwt. M.L.R., 1 64-pdr. M.L.R., 2 20-pdr., 2 M.	..	9·25	100	..
Cruiser (3rd class)			Emerald		*Comp.*	2120	2170	19	0	220	0	40	0	Pembroke	Thomson	1876	72,312	26,130	4 6-in. 81-cwt. B.L.R., 8 5-in. 38-cwt. do., 7 M., 2 l.	..	13·20	250	2280

t Includes Gun Mountings, &c.

y Propelling Machinery.

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GREAT BRITAIN.—Unarmoured Cruising Ships, &c.—*continued.*

comp., composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; Q.F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns; f. tu. or b. tu, fixed or bow torpedo-tube; l. car., launching torpedo carriage; P., deck protected; pp., partial deck protected. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Dischargers		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
			tons.		ft. in.	ft. in.	ft. in.				£	£			knots.	tons.	knots.
Sloop	**Espiegle**	*Comp.*	1130	1140	16 3	170 0	36 0	Devonp'rt	Maudslay	1880	37,000	11,770	10 5-in. 40-cwt. B.L.R., 8 M., 1 l.	..	11·5	150	1480
Gun Boat	**Espoir**	*Comp.*	465	470	10 0	125 0	23 6	Barrow	Barrow	..	..	..	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·8	40	..
Cruiser (2nd class)	**Euryalus**	Iron wood and zinc sheathed	4140	5110	23 3	280 0	45 6	Chatham	Easton and Anderson	1877	132,254	76,959	2 6-in. B.L.R., 12 90-cwt. M.L.R., 4 Q.F., 11 M., 3 l.	2 l. car.	14·72	550	2080
Gun Vessel	**Falcon**	*Comp.*	780	720	13 0	157 0	29 6	Birkenh'd	Laird	1877	25,763	10,805	1 90-cwt. M.L.R., 2 64-pdr. do., 2 M., 1 l.	..	10·70	120	1990
Cruiser (3rd class)	**Fearless** 2 *s.*	Steel	1580	3200	14 6	220 0	34 3	Barrow	Barrow	1886	x64,202	23,250	4 5-in. 40-cwt. B.L.R., 8 3-pdr. Q.F., 2 M., 1 l.	3 f. tu. 4 l. car.	17·27	450	6900
Gun Boat (2nd class)	**Firebrand**	*Comp.*	455	460	10 0	125 0	23 6	Glasgow	Thomson	1877	16,500	6,300	2 5-in. 38-cwt. B.L.R., 2 4-in. 22-cwt. do., 2 M.	..	10·17	40	..
„	**Firefly**	*Comp.*	455	470	10 0	125 0	23 6	Glasgow	Thomson	1877	16,400	6,300	2 64-in. M.L.R., 2 20-in. B.L.R., 2 M.	..	9·99	40	..
„	**Firm**	*Comp.*	455	510	10 0	125 0	23 6	Hull	Earle	1877	16,550	6,080	2 64-in. M.L.R., 2 20-in. B.L.R., 2 M.	..	10·2	40	..
Gun Vessel (2nd class)	**Flamingo**	*Comp.*	780	750	12 11	157 0	29 6	Devonp'rt	Elder	1876	25,774	9,228	2 5-in. 38-cwt. B.L.R., 2 64-pdr., 6 M.	..	11·00	130	1170
Sloop	**Flying Fish** (non-effective)	*Comp.*	940	840	14 2	160 0	31 4	Chatham	Humphrys	1873	29,444	10,001	2 90-cwt. M.L.R., 2 64-pdr. do., 2 M., 1 l.	..	10·96	100	1000
Gun Boat (2nd class)	**Forester**	*Comp.*	455	480	10 0	125 0	23 6	Earle	Earle	1877	16,500	6,100	2 64-in. M.L.R., 2 20-in. B.L.R.,	..	10·1	40	..

Cruiser . (2nd class)	P.	Forth .	2 s.	Steel	4050	5700	20	0	300	0	46	0	Pembroke	Hawthorn .	1886	151,952	50,000	2 8-inch 15-ton B.L.R., 10 6-in. B.L.R., 5 Q.F., 9 M., 2 l.	4 t. tu. 4 l. car.	18·00	900	8750
Gun Boat . . (2nd class)		Forward . .		*Comp.*	455	450	10	0	125	0	23	6	Barrow .	Hawthorn .	1877	14,100	6,400	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·4	40	..
„ „		Foxhound .		*Comp.*	455	470	10	0	125	0	23	6	Barrow .	Hawthorn .	1877	14,150	6,550	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·6	40	..
Gun Vessel .		Frolic . (Volunteer. Drill Ship.)	2 s.	*Comp.*	610	900	9	6	155	0	25	0	Chatham	Penn .	1872	16,512	6,593	1 90-cwt. M.L.R., 3 64-pdr. do., 2 20-pdr. B.L.R., 2 M.	..	10·70	80	880
Sloop . .		Gannet . .		*Comp.*	1130	1110	15	9	170	0	36	0	Sheerness	Humphrys	1878	39,581	12,889	2 90-cwt. M.L.R., 3 64-pdr. do., 2 5-in. 38-cwt. B.L.R., 6 M., 1 l.	..	11·53	150	1480
Cruiser . . (3rd class)		Garnet . .		*Comp.*	2120	2000	19	7	220	0	40	0	Chatham .	Hawthorn .	1877	64,689	27,779	14 5-in. 40-cwt. B.L.R., 7 M., 2 l.	.. ..	13·00	260	2000
Torpedo Gun Boat		Gleaner . .		Steel	735	4500	8	3	230	0	27	0	Sheerness	Sheerness	Bldg.	47,800	Total	2 47-in. Q.F., 4 3-pdr. do.	..	21·0	100	2500
Gun Boat . . (1st class)		Goldfinch . .		*Comp.*	805	1200	11	7½	165	0	31	0	Sheerness	Sheerness	Bldg.	39,300	Total	6 4-in. 25-cwt. B.L.R., 2 3-pdr. Q.F., 2 M.	..	13·0	105	2500
Gun Boat . . (2nd class)		Goshawk . .		*Comp.*	430	480	10	0	125	0	22	6	Pembroke	Maudslay .	1872	10,550	3,870	2 64-in. M.L.R., 2 20-in. B.L.R., 2 M.	..	10·24	40	..
Torpedo Gun Boat		Gossamer . .		Steel	735	4500	8	3	230	0	27	0	Sheerness	Sheerness	Bldg.	47,800	Total	2 47-in. Q.F., 4 3-pdr. do.	..	21·0	100	2500
Gun Boat . . (2nd class)		Grappler . .		*Comp.*	465	440	10	0	125	0	23	6	Barrow .	Barrow .	1880	15,600	5,250	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·8	..	..
Torpedo Gun Boat		Grasshopper	2 s.	Steel	525	3000	8	9	200	0	23	0	Sheerness	Maudslay	1887	x 20,897	y 13,168	1 4-in. 25-cwt. B.L.R., 6 3-pdr. Q.F.	2 f. tu. 2 l. car.	19·00	80	2400
Gun Vessel . (2nd class)		Griffon . .		*Comp.*	780	790	13	2	157	0	29	6	Birkenh'd	Laird .	1876	25,330	10,794	2 5-in. 38-cwt. B.L.R., 2 64-pdr. do., 6 M.	..	10·87	120	1990
Torpedo Depôt Ship.		Hecla . .		Iron.	6400	2260	24	3	391	7	38	9	(Purchased) Built and Engined by Harland & Wolff.		1878	126,190		4 64-pdr. M.L.R., 1 5-in. 38-cwt. B.L.R, 1 40-pdr. B.L.R., 14 M.	4 f. tu. or l. car.	11·7	2,200	26,400
Cruiser . pp. (3rd class)		Heroine . .		*Comp.*	1420	1130	15	9	200	0	38	0	Devonp'rt	Humphrys .	1881	52,500	14,500	8 6-in. 81-cwt. B.L.R., 4 M., 1 l.	..	13·11	400	6000
„ „ „		Hyacinth . .		*Comp.*	1420	1190	15	9	200	0	38	0	Devonp'rt	Humphrys .	1881	52,500	14,500	8 6-in. 81-cwt. B.L.R. 4 M., 1 l.	..	13·10	400	6000

x Includes Gun Mountings, &c. y Propelling Machinery.

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GREAT BRITAIN.—Unarmoured Cruising Ships, &c.—*continued.*

comp., composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; Q.F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns; f. tu. or b. tu, fixed or bow torpedo-tube; l. car., launching torpedo carriage; P., deck protected; pp., partial deck protected. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Dischargers		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
			tons.		ft. in.	ft. in.	ft. in.				£	£			knots.	tons.	knots.
Sloop	**Espiegle**	*Comp.*	1130	1140	16 3	170 0	36 0	Devonp'rt	Maudslay	1880	37,000	11,770	10 5-in. 40-cwt. B.L.R., 8 M., 1 l.	..	11·5	150	1480
Gun Boat	**Espoir**	*Comp.*	465	470	10 0	125 0	23 6	Barrow	Barrow	..	..	..	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·8	40	..
Cruiser (2nd class)	**Euryalus**	Iron wood and zinc sheathed	4140	5110	23 3	280 0	45 6	Chatham	Easton and Anderson	1877	132,254	76,959	2 6-in. B.L.R., 12 90-cwt. M.L.R., 4 Q.F., 11 M., 3 l.	2 l. car.	14·72	550	2080
Gun Vessel	**Falcon**	*Comp.*	780	720	13 0	157 0	29 6	Birkenh'd	Laird	1877	25,763	10,805	1 90-cwt. M.L.R., 2 64-pdr. do., 2 M., 1 l.	..	10·70	120	1990
Cruiser (3rd class)	**Fearless** 2 *s.*	Steel	1580	3200	14 6	220 0	34 3	Barrow	Barrow	1886	z64,202	23,250	4 5-in. 40-cwt. B.L.R., 8 3-pdr. Q.F., 2 M., 1 l.	3 f. tu. 4 l. car.	17·27	450	6900
Gun Boat (2nd class)	**Firebrand**	*Comp.*	455	460	10 0	125 0	23 6	Glasgow	Thomson	1877	16,500	6,300	2 5-in. 38-cwt. B.L.R., 2 4-in. 22-cwt. do., 2 M.	..	10·17	40	..
„	**Firefly**	*Comp.*	455	470	10 0	125 0	23 6	Glasgow	Thomson	1877	16,400	6,300	2 64-in. M.L.R., 2 20-in. B.L.R., 2 M.	..	9·99	40	..
„	**Firm**	*Comp.*	455	510	10 0	125 0	23 6	Hull	Earle	1877	16,550	6,080	2 64-in. M.L.R., 2 20-in. B.L.R., 2 M.	..	10·2	40	..
Gun Vessel (2nd class)	**Flamingo**	*Comp.*	780	750	12 11	157 0	29 6	Devonp'rt	Elder	1876	25,774	9,228	2 5-in. 38-cwt. B.L.R., 2 64-pdr., 6 M.	..	11·00	130	1170
Sloop	**Flying Fish** (non-effective)	*Comp.*	940	840	14 2	160 0	31 4	Chatham	Humphrys	1873	29,444	10,001	2 90-cwt. M.L.R., 2 64-pdr. do., 2 M., 1 l.	..	10·96	100	1000
Gun Boat (2nd class)	**Forester**	*Comp.*	455	480	10 0	125 0	23 6	Earle	Earle	1877	16,500	6,100	2 64-in. M.L.R., 2 20-in. B.L.R.,	..	10·1	10	..

	Cruiser (2nd class)	P. Perth	2 s.	Steel	4050	5700	20	0	300	0	40	0	Pembroke	Hawthorn					R.L.R., 5 Q.F., 9 M., 2 1.	4 f. tu.				
	Gun Boat (2nd class)	Forward		Comp.	455	450	10	0	125	0	23	6	Barrow	Hawthorn.	1877	14,100	6,400	2	64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..		9·4	40	..
	„ „	Foxhound		Comp.	455	470	10	0	125	0	23	6	Barrow	Hawthorn.	1877	14,150	6,550	2	64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..		9·6	40	..
	Gun Vessel	Frolic (Volunteer Drill Ship.)	2 s.	Comp.	610	900	9	6	155	0	25	0	Chatham	Penn	1872	16,512	6,593	1	90-cwt. M.L.R., 3 64-pdr. do., 2 20-pdr. B.L.R., 2 M.	..		10·70	80	880
	Sloop	Gannet		Comp.	1130	1110	15	9	170	0	36	0	Sheerness	Humphrys	1878	39,581	12,889	2	90-cwt. M.L.R., 3 64-pdr. do., 2 5-in. 38-cwt. B.L.R., 6 M., 1 1.	..		11·53	150	1480
	Cruiser (3rd class)	Garnet		Comp.	2120	2000	19	7	220	0	40	0	Chatham.	Hawthorn.	1877	64,689	27,779	14	5-in. 40-cwt. B.L.R., 7 M., 2 1.	..		13·00	260	2000
	Torpedo Gun Boat	Gleaner		Steel	735	4500	8	3	230	0	27	0	Sheerness	Sheerness	Bldg.	47,800	Total	2	47-in. Q.F., 4 3-pdr. do.	..		21·0	100	2500
	Gun Boat (1st class)	Goldfinch		Comp.	805	1200	11	7½	165	0	31	0	Sheerness	Sheerness	Bldg.	89,300	Total	6	4-in. 25-cwt. B.L.R., 2 3-pdr. Q.F., 2 M.	..		13·0	105	2500
	Gun Boat (2nd class)	Goshawk		Comp.	430	480	10	0	125	0	22	6	Pembroke	Maudslay	1872	10,550	3,870	2	64-pdr. M.L.R., 2 20-in. B.L.R., 2 M.	..		10·24	40	..
	Torpedo Gun Boat	Gossamer		Steel	735	4500	8	3	230	0	27	0	Sheerness	Sheerness	Bldg.	47,800	Total	2	47-in. Q.F., 4 3-pdr. do.	..		21·0	100	2500
	Gun Boat (2nd class)	Grappler		Comp.	465	440	10	0	125	0	23	6	Barrow	Barrow	1880	15,600	5,250	2	64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..		9·8	..	..
	Torpedo Gun Boat	Grasshopper	2 s.	Steel	525	3000	8	9	200	0	23	0	Sheerness	Maudslay	1887	20,897 x	13,168 y	1	4-in. 25-cwt. B.L.R., 6 3-pdr. Q.F.	2 f. tu. 2 l. car.		19·00	80	2400
	Gun Vessel (2nd class)	Griffon		Comp.	780	790	13	2	157	0	29	6	Birkenh'd	Laird	1876	25,330	10,794	2	5-in. 38-cwt. B.L.R., 2 64-pdr. do., 6 M.	..		10·87	120	1990
	Torpedo Depôt Ship.	Hecla		Iron.	6400	2260	24	3	391	7	38	9	(Purchased) Built and Engined by Harland & Wolff.		1878	126,190		4	64-pdr. M.L.R., 1 5-in. 38-cwt. B.L.R, 1 40-pdr. B.L.R., 14 M.	4 f. tu. or l. car.		11·7	2,200	26,400
T 2	Cruiser (3rd class) pp.	Heroine		Comp.	1420	1130	15	9	200	0	38	0	Devonp'rt	Humphrys.	1881	52,500	14,500	8	6-in. 81-cwt. B.L.R., 4 M., 1 1.	..		13·11	400	6000
	„ „ „	Hyacinth		Comp.	1420	1190	15	9	200	0	38	0	Devonp'rt	Humphrys.	1881	52,500	14,500	8	6-in. 81-cwt. B.L.R. 4 M., 1 1.	..		13·10	400	6000

x Includes Gun Mountings, &c. y Propelling Machinery.

GREAT BRITAIN.—Unarmoured Cruising Ships, &c.—*continued.*

comp. composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; Q.F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns; f. tu. or b. tu., fixed or bow torpedo tube; l. car, launching torpedo carriage; P., deck protected; pp., partial deck protected. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Dischargers		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
			tons.		ft. in.	ft. in.	ft. in.				£	£			knots.	tons.	knots.
Sloop	**Icarus**	*Comp.*	970	1230	13 6	167 0	32 0	Devonp'rt	Barrow	1886	x39,369	y12,735	8 5-in. 38-cwt. B.L.R., 8 M., 1 l.	..	12·5	150	2300
Cruiser (2nd class)	**Inconstant**	Iron wood and copper sheathed	5780	7360	25 6	337 4	50 3	Pembroke	Penn	1868	138,585	74,739	10 9-in. 12-ton M.L.R., 6 7-in. 6½-ton M.L.R., 6 20-pdr. B.L.R., 2 Q.F., 11 M., 2 l.	2 l. car. ..	16·20	750	2780
„	**Iris** 2 *s.*	Steel	3730	7330	22 0	300 0	46 0	Pembroke	Maudslay	1877	110,868	102,318	4 Q.F., 7 M., 1 l., 13 5-in. 2-ton B.L.R.	4 l. car.	18·0	780	4400
Sloop	**Kingfisher**	*Comp.*	1130	1090	15 9	170 0	36 0	Sheerness	Maudslay	1879	39,300	11,850	2 90-cwt. M.L.R., 4 64-pdr. do., 4 M., 1 l.	..	11·60	150	1480
Gun Vessel (1st class)	**Landrail** 2 *s.*	Steel	950	1500	10 6	195 0	28 0	Devonp'rt	Penn	1886	37,363	12,600	1 6-in. 5-ton B.L.R., 3 5-in. 38-cwt. B.L.R., 7 M.	1 b. tu. 4 l. car.	14·5	250	10,000
Gun Boat (1st class)	**Lapwing**	*Comp.*	805	1200	11 7½	165 0	31 0	Devonp'rt	Devonport	Bldg.	39,300	Total	6 4-in. 25-cwt. B.L.G., 2 Q.F., 2 M.	..	13·0	105	2500
Cruiser pp. (2nd class)	**Leander** 2 *s.*	Steel	4300	5500	20 6	300 0	46 0	Glasgow	Napier	1882	87,843 estim'td	60,610 estim'td	10 6-in. 5-ton B.L.R., 14 M., 2 l.	4 l. car.	17·00	1000	11,000
Gun Vessel (2nd class)	**Lily**	*Comp.*	720	830	13 6	150 0	28 6	Glasgow	Napier	1874	24,141	9,967	1 90-cwt. M.L.R., 2 64-cwt. do., 2 M., 1 l.	..	10·60	70	750
„	**Linnet** 2 *s.*	*Comp.*	756	1050	10 11	165 0	29 0	Blackwall	Rennie	1880	25,281	10,382	2 90-cwt. M.L.R., 3 20-pdr. B.L.R., 2 M.	..	11·80	180	2400
Gun Boat (1st class)	**Lizard**	*Comp.*	715	1000	11 10	165 0	29 0	Belfast	Harland	1887	42,770	10,000	6 4-in. 25-cwt. B.L.R., 4 M.	..	13·00	105	2500
Cruiser P. (2nd class)	**Magicienne**	Steel wood and copper sheathed	2050	9000	17 6	265 0	42 0	Glasgow	Hawthorn	1888	136,000	Total	6 6-in. 5-ton B.L.R., 10 Q.F., 3 M., 1 l.	2 f. tu. 4 l. car.	19·75	400	8000

Cruiser (2nd class)	P.	Marathon		Steel wood and copper sheathed	2950	9000	17	6	265	0	42	0	Glasgow	Hawthorn	1888	136,000	Total.	6	6-in. 5-ton B.L.R., 10 Q.F., 3 M., 1 l.	2 f. tu. 4 l. car	19	75	400	8000
Sloop		Mariner		*Comp.*	970	970	14	0	167	0	32	0	Devonp'rt	Hawthorn.	1884	37,156	12,841	8	5-in. 38-cwt. B.L.R., 8 M., 1 l.	..	11·50		150	2300
Cruiser (2nd class)	P.	Medea	2 *s.*	Steel	2800	9000	16	6	265	0	41	0	Chatham	Humphrys	1888	*x*88,400	*y*53,800	6	6-in. 5-ton B.L.R., 10 Q.F., 3 M. 1 l.	2 f. tu. 4 l. car	20·00		400	8000
„ „	P.	Medea (modified)	2 *s.*	Steel	3400	9000	16	4	300	0	43	0	Chatham	..	Bldg.	..	..		2 6-in. Q.F., 6 47-in. do., 9 6-in. and 3-in. do.	..	20·0		400	8000
„ „	P.	„ „		„	„	„	„		„		„		„	..	„	..	..		„ „ „	..	„		„	„
„ „	P.	Medusa	2 *s.*	Steel	2800	9000	16	6	265	0	41	0	Chatham	Humphrys	1888	*x*88,400	*y*53,300	6	6-in. 5-ton B.L.R., 10 Q.F., 3 M. 1 l.	2 f. tu. 4 l. car	20·00		400	8000
Sloop		Melita		*Comp.*	970	1200	13	6	167	0	32	0	Malta	Malta Dock Yard	1888	60,179	Total	8	5-in. 40-cwt. B.L.R., 8 M., 1 l.	..	12·50		150	2100
Cruiser (2nd class)	P.	Melpomene	2 *s.*	Steel wood and copper sheathed	2950	9000	17	6	265	0	41	0	Portsm'th	Palmer Co.	1888	*x*92,000	*y*50,000	6	6-in. 5-ton B.L.R., 10 Q.F., 3 M., 1 l.	2 f. tu. 4 l. car	19·75		400	8000
Cruiser (2nd class)		Mercury	2 *s.*	Steel	3730	7290	22	0	300	0	46	0	Pembroke	Maudslay	1878	119,452	93,800	13	5-in. 40-cwt. B.L.R., 4 Q.F., 7 M., 1 l.	4 l. car.	18·00		780	4950
Gun Boat (2nd class)		Merlin		*Comp.*	430	430	9	6	125	0	22	6	Pembroke	Watt	1871	10,400	3,800	2	64-in. M.L.R., 2 20-in. B.L.R., 2 M.	..	9·5		40	..
Cruiser (2nd class)	P.	Mersey	2 *s.*	Steel	4050	6000	19	6	300	0	46	0	Chatham.	Humphrys.	1885	100,000 estim'td	54,000 estim'td	2	8-in. 15 ton B.L.R., 10 6-in. B.L.R., 5 Q.F., 9 M., 2 l.	2 tu. sub 4 l. car.	18·00		900	8750
Sloop		Miranda (surveying vessel)		*Comp.*	1130	1020	15	9	170	0	36	0	Devonp'rt	Napier	1879	37,000	11,700	2	4-in. B.L.R., 2 M., 1 l.	..	11·50		150	1480
Gun Boat (2nd class)		Misletoe		*Comp.*	560	650	13	4	135	0	26	0	Birkenh'd	Laird	1883	18,000	8,500	2	5-in. 38-cwt., B.L.R., 2 4-in. 22 cwt. do., 2 M., 2 l.	..	10·7		95	..
Cruiser (3rd class)		Mohawk	2 *s.*	Steel	1770	3500	14	6	225	0	36	0	Glasgow	Thomson	1886	*x*55,916	*y*31,667	6	6-in. 5-ton B.L.R., 8 Q.F., 2 M., 1 l.	1 f. tu. 2 l. car.	17·00		475	7000
Sloop		Mutine		*Comp.*	1130	1120	15	9	170	0	36	0	Devonp'rt	Maudslay	1880	37,500	11,770	10	5-in. 40-cwt. B.L.R., 8 M., 1 l.	..	12·10		150	1480
Gun Vessel		Myrmidon (Surveying)		Wood	877	720	11	9	185	0	28	4	Chatham.	Humphrys.	1867	26,500	10,900	4	20-ton B.L.R., 2 M.	..	10·10		130	..
Sloop		Nymphe		*Comp.*	1140	2000	12	6	195	0	28	0	Portsm'th	Greenock F'ndry Co.	1888	*x*42,400	*y*15,200	8	5-in. 40-cwt. B.L.R. 8 M.	..	14·50		160	3000

x Includes Gun Mountings, &c.

y Propelling Machinery.

GREAT BRITAIN.—Unarmoured Cruising Ships, &c.—*continued.*

comp. composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; Q.F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns; f. tu. or b. tu., fixed or bow torpedo tube; l. car., launching torpedo carriage; P., deck protected; pp., partial deck protected. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Dischargers		Coals that can be carried in bunkers.	Distance that can be steamed at 10 knots speed.
			tons.		ft. in.	ft. in.	ft. in.				£	£			knots.	tons.	knots.
Cruiser . . (3rd class)	**Opal** . . .	*Comp.*	2120	2190	18 7	220 0	40 0	Sund'land	Napier .	1875	68,574	27,375	12 64-pdr. 64 cwt. M.L.R., 6 M., 2 l. .	..	13·4	270	2250
Sloop . .	**Osprey** . .	*Comp.*	1130	1010	15 11	170 0	36 0	Sheerness	Humphrys.	1876	39,664	11,674	2 90-cwt. M.L.R., 4 64-pdr. do., 4 M., 1 l.	..	11·5	150	1480
Cruiser . P. (2nd class)	**Pallas** . .	..	2575	7500	15 6	265 0	41 0	Pentows .	..	Bldg.	..	..	8 47-in. Q.F., 8 3-in. Q.F., 4 M. 1 l.	1 f. tu. 2 l. car.	19·0	..	.. ..
Cruiser . P. (2nd class)	**Pandora** (Special for Australia) 2 *s.*	Steel	2575	7500	15 6	265 0	41 0	Elswick .	..	Bldg.	..	..	8 47-in. Q.F., 8 3-in. Q.F., 4 M., 1 l.	1 f. tu. 2 l. car.	19·0	..	..
Gun Boat . . (1st class)	**Partridge** . .	*Comp.*	755	1200	11 4	165 0	30 0	Devonp'rt	Devonport	1888	27,800	10,000	6 4-in. 25-cwt. B.L.R., 4 M.	..	13·25	105	2500
„ „ . .	**Peacock** . .	*Comp.*	755	1200	11 4	165 0	29 0	Pembroke	Barrow Co.	1888	27,600	10,000	6 4-in. 25 cwt. B.L.R., 4 M.	..	13·25	105	2500
Cruiser . P. (2nd class)	**Pearl** . 2*s.*	..	2578	7500	15 6	265 0	41 0	Pembroke	..	Bldg.	..	..	8 47-in. Q.F., 8 3-in. Q.F., 4 M. 1 l.	1 f. tu. 2 l. car.	19·0	..	..
Sloop . .	**Pegasus** . .	*Comp.*	1130	970	15 9	170 0	36 0	Devonp'rt	Laird .	1878	36,697	12,809	2 90-cwt. M.L.R., 4 64-pdr. do., 4 M., 1 l.	..	11·47	150	1750
„ . .	**Pelican** . .	*Comp.*	1130	1060	15 3	170 0	36 0	Devonp'rt	Humphrys.	1877	41,282	14,939	2 6-in. 5-ton B.L.R., 6 5-in. 38-cwt. B.L.R., 4 M., 1 l.	..	12·00	150	1480
Cruiser . P. (2nd class)	**Pelorus** (Special for Australia) 2 *s.*	Steel	2575	7500	15 6	265 0	41 0	Elswick	..	Bldg.	..	..	8 47-in. Q.F., 8 3-in. Q.F., 4 M., 1 l.	1 f. tu. 2 l. car.	19·0	..	..
Sloop . .	**Penguin** . .	*Comp.*	1130	1110	16 1	170 0	36 0	Glasgow .	Hawthorn.	1876	39,611	12,500	2 90-cwt. M.L.R., 2 5-in. 38-cwt. B.L.R., 3 64-pdr. M.L.R., 4 M., 1 l.	..	11·00	150	1500
Cruiser, . P. (2nd class)	**Persian** (Special for Australia) 2 *s.*	Steel	2575	7500	15 6	265 0	41 0	Elswick	..	Bldg.	..	..	8 47-in. Q.F., 8 3-in. Q.F., 4 M., 1 l.	1 f. tu. 2 l. car.	19·0	..	..
Cruiser . . pp.	**Phaeton** . 2 *s.*	Steel	4300	5500	20 6	300 0	46 0	Glasgow .	Napier .	1883	86,763	58,425	10 6-in. 5-ton B.L.R., 16 M., 2 l.	4 l. car.	17·00	1000	11,000

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Gun Boat (1st class)		Pheasant		Comp.	755	1200	11	4	165	0	29	0	Devonpo't	Devonport	1888	x27,800	y10,000	6 4-in. 25 B.L.R., 4 M.		13·25	105	2500
Cruiser (2nd class)	P.	Philomel		..	2575	7500	15	6	265	0	41	0	Devonpo't	..	Bldg.	..	..	8 47-in. Q.F., 8 3-pdr. Q.F.	1 f. tu. 2 l. car.	19·0	..	..
Cruiser (2nd class)	P.	Phœbe		..	2575	7500	15	6	265	0	41	0	Devonpo't	..	Bldg.	..	..	8 47-in. Q.F., 8 3-pdr. Q.F., 4 M., 1 l.	1 f. tu. 2 l. car.	19·0	..	..
Cruiser (2nd class)	P.	Phœnix (Special for Australia) 2 *s.*		Steel	2575	7500	15	6	265	0	41	0	Glasgow	Thomson	Bldg.	..	..	8 47-in. Q.F., 8 3-pdr. Q.F., 4 M., 1 l.	1 f. tu. 2 l. car.	19·0	..	..
Gun Boat (1st class)		Pigeon		Comp.	755	1200	11	4	165	0	30	0	Pembroke	Barrow	1888	x27,800	y10,000	6 4-in. B.L.R.	..	13·25	105	2500
„	„	Pigmy		Comp.	755	1200	11	4	165	0	30	0	Sheerness	Barrow	1888	28,000	9,700	6 4-in. 25-cwt. B.L.R., 4 M.	..	13·25	105	2500
„	„	Plover		Comp.	755	1200	11	4	165	0	30	0	Pembroke	Barrow	1888	28,000	9,700	6 4-in. 25 B.L.R., 4 M.	..	13·25	105	2500
Torpedo Ram,	P.	Polyphemus 2 *s.*		Steel	2640	5520	20	0	240	0	40	0	Chatham	Humphrys	1881	114,000	60,450	6 6-pdr. Q.F., 2 M.	5 f. tu. subm.	17·80	300	3400
Cruiser (3rd class)		Porpoise 2 *s.*		Steel	1770	3500	14	6	225	0	36	0	Glasgow	Thomson	1886	x55,916	y31,667	6 6-in. 5-ton B.L.R., 8 3-pdr. Q.F., 2 M., 1 l.	1 f. tu. 2 l. car.	17·00	475	7000
Cruiser (2nd class)	P.	Psyche (Special for Australia) 2 *s.*		Steel	2575	7500	15	6	265	0	41	0	Glasgow	Thomson	Bldg.	..	..	8 47-in. Q.F., 8 3-pdr. Q.F., 4 M., 1 l.	1 f. tu. 2 l. car.	19·00	..	..
Cruiser (3rd class)	pp.	Pylades		Comp.	1420	1640	15	9	200	0	38	0	Sheerness	Laird	1884	45,500	16,500	14 5-in. 38-cwt. B.L.R., 8 M., 1 l.	..	13·00	400	6400
Sloop		Racer		Comp.	970	920	14	0	167	0	32	0	Devonp'rt	Hawthorn	1884	37,000	12,000	8 5-in. 38 cwt. B.L.R., 8 M., 1 l.	..	11·50	150	2300
Cruiser (3rd class)		Racoon 2 *s.*		Steel	1770	4500	13	6	225	0	36	0	Devonp'rt	Harland	..	x60,606	y31,000	6 6-in. 5-ton B.L.R., 8 Q.F., 2 M., 1 l.	1 f. tu. 2 l. car.	17·00	475	7000
Cruiser (2nd class)		Raleigh		Iron wood and copper sheathed	5200	5640	24	7	298	0	49	0	Chatham	Humphrys	1873	147,248	46,138	8 90-cwt. M.L.R., 8 6-in. 81-cwt., B.L.R., 8 5-in. 38-cwt. do., 12 M., 4 l.	2 l. car	15·50	550	2100
Gun Vessel (2nd class)		Rambler (Surveying service).		Comp.	835	690	13	7	157	0	29	6	Glasgow	Elder	1880	26,625	10,413	4 20-pdr. B.L.R., 1 M., 1 l.	..	10·66	40	1050
„	„	Ranger		Comp.	835	760	13	7	157	0	29	6	Glasgow	Elder	1880	26,558	10,710	1 90-cwt. M.L.R., 2 64-pdr. do., 2 M., 1 l.	..	10·95	110	1500
Cruiser (3rd class)	pp.	Rapid		Comp.	1420	1400	15	9	200	0	38	0	Devonp'rt	Maudslay	1883	52,107	16,119	2 6-in. 81-cwt. B.L.R., 10 5-in. 38-cwt. do., 4 M., 1 l.	..	13·10	400	6000
Gun Boat (1st class)		Rattler		Comp.	715	1200	11	0	165	0	29	0	Elswick	Hawthorn	1886	x28,134	y10,600	6 4-in. 25-cwt. B.L.R., 4 M.	..	13·0	105	2500

x Includes Gun Mountings, &c.

y Propelling Machinery.

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GREAT BRITAIN.—Unarmoured Cruising Ships, &c.—*continued.*

comp. composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; Q.F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns; f. tu. or b. tu., fixed or bow torpedo tube; l. car., launching torpedo carriage; P., deck protected; pp., partial deck protected. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Dischargers		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
			tons.		ft. in.	ft. in.	ft. in.				£	£			knots.	tons.	knots.
Torpedo Gunboat	**Rattlesnake** 2 *s.*	Steel	550	2700	8 0	200 0	23 0	Birkenh'd	Laird	1886	*x*21,425	*y*14,000	1 4-in. 25-cwt. B.L.R., 6 Q.F.	2 f. tu. 2 l. car.	18·5	100	3050
Gun Boat (2nd class)	**Raven**	*Comp.*	465	380	10 0	125 0	23 6	Poplar	Rennie	1882	14,800	6,250	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·5	40	..
Gun Vessel (2nd class)	**Ready** 2 *s.*	*Comp.*	610	890	9 10	155 0	25 0	Chatham.	Penn	1872	17,231	6,613	1 7-in. 6½-ton M.L.R., 1 64-pdr. do., 2 20-pdr. B.L.R., 2 M.	..	11·10	80	880
Gun Boat (1st class)	**Redbreast**	*Comp.*	805	1200	11 7½	165 0	31 0	Pembroke	Earle	1888	29,400	9,300	6 4-in. 25-cwt. B.L.R., 4 M.	..	13·0	105	2500
„ „	**Redpole**	*Comp.*	805	1200	11 7½	165 0	31 0	Pembroke	Earle	1888	29,400	9,300	6 4-in. 25-cwt. B.L.R., 4 M.	..	13·0	105	2500
Gun Boat (2nd class)	**Redwing**	Tender	461	440	10 0	125 0	23 6	Pembroke	Maudslay	1880	16,400	5,800	2 20-in. B.L.R., 2 M.	..	9·68	40	..
Sloop	**Reindeer**	*Comp.*	970	1030	14 0	167 0	32 0	Devonp'rt	Hawthorn.	1883	34,834	52,787	6 5-in. 36-cwt. do., 8 M., 1 l.	..	11·50	150	3200
Surveying Vessel	**Research**	..	520	450	8 6	155 0	24 0	Chatham.	Barrow	1888	18,500	7,500	1 7-pdr. gun.	..	10·5	70	..
Gun Vessel (2nd class)	**Rifleman** 2 *s.*	*Comp.*	610	710	10 1	155 0	25 0	Chatham.	Penn	1872	17,970	6,589	2 90-cwt. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	10·71	80	880
Gun Boat (1st class)	**Ringdove**	*Comp.*	805	1200	11 7½	165 0	31 5	Devonp'rt	Devonport	Bldg.	39,300	Total	6 4-in. 25-cwt. B.L.R., 2 Q.F., 2 M.	..	13·0	105	2500
Cruiser (2nd class)	**Rover**	Iron wood and zinc sheathed	3460	4960	23 0	280 0	43 6	Blackwall	Ravenhill	1874	104,718	65,021	14 6-in. 81-cwt. B.L.R., 8 M., 3 l.	2 l. car.	14·53	410	1840
Cruiser, pp. (3rd class)	**Royalist**	*Comp.*	1420	1510	15 9	200 0	38 0	Devonp'rt	Maudslay	1883	52,134	16·039	2 6-in. 81-cwt. B.L.R., 10 5-in. 38-cwt. do. 4 M., 1 l.	..	13·10	400	6000

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Cruiser (3rd class)																					
Torpedo Gunboat	Salamander	2 *s.*	Steel	735	4500	8	3	..	..	Chatham	Maudslay	Bldg.	49,000	Total	2 4·7-in. Q.F., 4 3-pdr. Q.F.	1 f. tu. 2 l. car.	21·0	100	2500
Torpedo Gunboat	Sandfly	2 *s.*	Steel	525	3000	8	9	200	0 23 0	Devonp'rt	Maudslay	1887	*x* 22,877	*y* 13,290	1 4-in. 25-cwt. B.L.R., 6 3-pdr. Q.F.	2 f. tu. 2 l. car.	19·00	80	2400
Cruiser (3rd class)	Sapphire		Wood	1970	2360	18	1	220	0 37 0	Devonp'rt	Hawthorn	1874	51,986	26,311	12 64-pdr. M.L.R., 6 M., 2 l.	..	13·58	270	2080
Cruiser pp. (3rd class)	Satellite		*Comp.*	1420	1400	15	9	200	0 38 0	Sheerness	Humphrys	1881	47,500	15,400	8 6-in. 81-cwt. B.L.R., 4 M., 1 l.	..	13·10	400	6000
Cruiser (3rd class)	Scout	2 *s.*	Steel	1580	3200	14	6	220	0 34 0	Glasgow	Thomson	1885	*x* 63,916	*y* 23,600	4 5-in. 40-cwt. B.L.R., 8 3-pdr. Q.F., 2 M., 1 l.	3 f. tu. 4 l. car.	17·00	450	6900
Torpedo Gunboat	Seagull	2 *s.*	Steel	735	4500	8	3	..	..	Chatham.	Maudslay	Bldg.	49,000	Total	2 4·7-in. 4 3-pdr. Q.F.	1 f. tu. 2 l. car.	21·0	100	2500
Cruiser (3rd class)	Serpent	2 *s.*	Steel	1770	4500	14	6	225	0 36 0	Devonp'rt	Harland	1887	60,606	31,000 estim'td	6 6-in. 5-ton B.L.R., 8 3-pdr. Q.F., 2 M., 1 l.	1 f. tu. 2 l. car.	17·00	475	7000
Cruiser P. (2nd class)	Severn	2 *s.*	Steel	4050	6000	19	6	300	0 46 0	Chatham.	Humphrys.	1885	*x* 151,681	*y* 60,940	2 8-in. 15-ton B.L.R., 10 6-in. B.L.R., 5 Q.F., 9 M., 2 l.	2 tu. sub 4 l. car.	18·17	900	8750
Cruiser (2nd class)	Shah		Iron wood and copper sheathed	6250	7480	26	5½	334	0 52 0	Portsm'th	Ravenhill	1873	177,912	57,333	2 9-in. 12-ton M.L.R., 16 7-in. 6½-ton do., 8 5-in. 38-cwt. B.L.R., 4 Q.F., 12 M., 4 l.	2 l. car.	16·20	890	6840
Torpedo Gunboat	Sharpshooter	2 *s.*	Steel	735	4500	8	3	230	0 27 0	Devonp'rt	Bellis	1888	*x* 29,675	*y* 20,354	2 4·7-in. Q.F., 4 3-pdr. do.	1 f. tu. 2 l. car.	21·00	100	2500
„ „	(Three vessels not named)	2 *s.*	Steel	735	4500	8	3	230	0 27 0	Sheerness	..	Bldg.	..	..	2 4·7-in. Q.F., 4 3-pdr. do.	1 f. tu. 2 l. car.	21·0	100	2500
„ „	(One vessel not named)	2 *s.*	Steel	735	4500	8	3	230	0 27 0	Devonp'rt	..	Bldg.	..	..	2 4·7-in. Q.F., 4 3-pdr. do.	1 f. tu. 2 l. car.	21·0	100	2500
„ „	Sheldrake.	2 *s.*	Steel	735	4500	8	3	230	0 27 0	Chatham.	Maudslay	Bldg.	49,000	Total	2 4·7-in. Q.F., 4 3-pdr. do.	1 f. tu. 2 l. car.	21·00	100	2500
„ „	Skipjack	2 *s.*	Steel	735	4500	8	3	230	0 27 0	Chatham.	Laird	Bldg.	49,000	Total	2 4·7-in. Q.F., 4 3-pdr. do.	1 f. tu. 2 l. car.	21·00	100	2500
„ „	Spanker	2 *s.*	Steel	735	4500	8	3	230	0 27 0	Devonp'rt	Bellis	Bldg.	49,000	Total	2 4·7-in. Q.F., 4 3-pdr. do.	1 f. tu. 2 l. car.	21·00	100	2500
Gun Boat (1st class)	Sparrow		*Comp.*	805	1200	11	7½	165	0 31 0	Greenock	Greenock	Bldg.	39,000	Total	6 4-in. 25-cwt. B.L.R., 2 3-pdr. Q.F., 2 M.	..	13·00	105	2500
Torpedo Gunboat	Speedwell	2 *s.*	Steel	735	4500	8	3	230	0 27 0	Devonp'rt	Laird	1889	50,000	Total	2 4·7-in. Q.F., 4 3-pdr. do.	1 f. tu. 2 l. car.	21·00	100	2500
Torpedo Gunboat	Spider	2 *s.*	Steel	525	3000	8	9	200	0 23 0	Devonp'rt	Maudslay	1887	*x* 23,000	*y* 13,300	1 4-in. 25-cwt. B.L.R., 6 Q.F.	2 f. tu. 2 l. car.	19·00	80	2400

x Includes Gun Mountings, &c.

y Propelling Machinery.

GREAT BRITAIN.—Unarmoured Cruising Ships, &c. —*continued.*

comp. composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; Q.F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns; f. tu. or b. tu., fixed or bow torpedo tube; l. car., launching torpedo carriage; P., deck protected; pp., partial deck protected. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Dischargers		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
			tons.		ft. in.	ft. in.	ft. in.				£	£			knots.	tons.	knots.
Gun Boat . . (2nd class)	Starling . .	*Comp.*	465	360	10 0	125 0	23 6	Poplar .	Rennie .	1882	14,850	6,250	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·50	40	..
" "	Stork (Surveying Vessel)	*Comp.*	465	350	10 0	125 0	23 6	Poplar .	Rennie .	1882	14,900	6,250	2 l., 1 M.	..	9·50	40	..
Despatch Vessel.	Surprise 2 *s.*	Steel	1650	3030	14 0	250 0	32 6	Jarrow .	Palmer .	1885	*x*49,084	*y*29,680	4 5-in. 38-cwt. B.L.R., 4 6-pdr. Q.F., 2 M., 1 l.	..	17·00	400	6450
Gun Vessel .	Sylvia (Surveying non-effective)	Wood	865	690	12 0	185 0	28 4	Woolwich	Humphrys	1866	27,500	14,000	2 20-pdr. B.L.R., 2 M. . .	..	10·27	160	..
Sloop . .	Swallow . 2 *s.*	*Comp.*	1130	1570	11 6	195 0	28 0	Sheerness	Rennie .	1886	44,797	15,000	8 5-in. 38-cwt. B.L.R., 8 M. .	..	13·50	280	5000
Gun Vessel . (2nd class)	Swift. . 2 *s.*	*Comp.*	756	1010	10 11	165 0	29 0	Blackwall	Rennie .	1879	24,290	10,380	2 90-cwt. M.L.R., 3 6-pdr. Q.F., 2 M.	..	11·81	180	2400
Gun Boat . . (2nd class)	Swinger . .	*Comp.*	430	520	9 6	125 0	22 6	Pembroke	Humphrys	1872	10,600	3,900	2 64-in. M.L.R., 2 20-in. B.L.R., 2 M.	..	10·38	40	..
Cruiser . . (3rd class)	Tartar . 2 *s.*	Steel	1770	3500	14 3½	225 0	36 0	Glasgow .	Thomson .	1886	*x*55,916	*y*31,667	6 6-in. 5-ton B.L.R., 8 3-pdr. Q.F., 2 M., 1 l.	1 f. tu. 2 l. car.	17·33	325	4850
Corvette . . (Troop Ship)	Thalia . .	Wood	2240	1600	18 3	200 0	40 4	Woolwich	Napier .	1869	47,915	21,709	6 64-pdr. M.L.R., 2 M., 2 l. .	..	11·14	230	2350
Cruiser . P. (2nd class)	Thames . 2 *s.*	Steel	4050	5700	19 6	300 0	46 0	Pembroke	Penn .	1886	151,952	53,500	2 8-in. 15-ton B.L.R., 10 6-in. B.L.R., 5 Q.F., 9 M., 2 l.	2 tu. sub 4 l. car.	18·00	900	8750
Gun Boat . . (1st class)	Thrush . .	*Comp.*	805	1200	11 7½	165 0	31 0	Greenock	Greenock Finday Co.	Bldg.	39,000	Total	6 4-in. 25-cwt. B.L.R., 2 3-pdr.	..	13·00	105	2500

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Cruiser . . (3rd class)	Tourmaline .		*Comp.*	2120	2000	18	8	220	0	40	0	Middl'sbro	Hawthorn.	1875	69,998	25,771	4 6-in. 89-cwt. B.L.R., 8 5-in. 38-cwt. do., 8 M., 2 l.	..	12·62	280	2000
„ . .	Turquoise .		*Comp.*	2120	1990	19	1	220	0	40	0	Hull .	Earle .	1876	68,089	27,458	12 64-pdr. M.L.R., 7 M., 2 l. .	..	12·32	280	2080
Torpedo Vessel .	Vesuvius .	2 *s.*	Iron	245	390	8	6	90	0	22	0	Pembroke	Maudslay .	1874	10,522	7,465	Nil	4 tu.	9·71	25	..
Cruiser . . (2nd class)	Volage . .		Iron wood and copper sheathed	3080	4530	22	0	270	0	42	0	Blackwall	Ravenhill .	1874	91,817	41,000	10 6-in. 81-cwt. B.L.R., 2 64-pdr. M.L.R., 9 M., 2 l.	2 l. car.	15·30	420	1850
Torpedo Depôt Ship. P.	Vulcan .	2 *s.*	Steel	6620	12000	23	0	350	0	58	0	Portsm'th	Humphrys	Bldg.	257,000	Total	8 4·7-in. Q.F., 12 3-in. Q.F. .	2 f. tu. 4 l. car.	20·0	1000	12,000
Sloop . .	Wanderer .		*Comp.*	925	750	14	0	157	0	32	0	Middl'sbro	Hawthorn.	1883	25,850	9,800	2 6-in. 81-cwt. B.L.R., 2 5-in. 36-cwt. do., 2 M., 1 l.	..	11·30	135	1700
Gun Boat . . (2nd class)	Watchful . .		*Comp.*	560	650	11	6	135	0	26	0	Birkenh'd	Lairds .	1883	32,527	Total	2 5-in. 40-cwt. B.L.R., 2 4-in. 22-cwt. do., 2 M.	..	11·0	85	..
Torpedo Gunboat	Whiting (Special for Australia)	2 *s.*	Steel	735	4500	8	3	230	0	27	0	Elswick .	..	Bldg.	..	..	2 4·7-in. Q.F., 4 3-pdr. do., 1 M.	1 f. tu. 2 l. car.	21·00	100	2500
Gun Boat . . (1st class)	Widgeon .	2 *s.*	*Comp.*	805	1200	11	7½	165	0	30	0	Pembroke	Rennie .	Bldg.	38,000	Total	6 4-in. 25-cwt. B.L.R., 2 3-pdr. Q.F., 2 M.	..	13·00	105	2500
Sloop . .	Wild Swan .		*Comp.*	1130	1090	15	10	170	0	36	0	Glasgow .	Hawthorn.	1876	39,643	11,853	2 6-in. 81-cwt. B.L.R., 6 5-in. 38-cwt. do., 4 M., 1 l.	..	11·35	150	1120
Torpedo Gunboat	Wizard (Special for Australia)	2 *s.*	Steel	735	4500	8	3	230	0	27	0	Elswick .	..	Bldg.	..	..	2 4·7-in. Q.F., 4 3-pdr. do., 1 M.	1 f. tu. 2 l. car.	21·00	100	2500
Gun Boat . . (2nd class)	Wrangler . .		*Comp.*	465	480	10	6	125	0	23	6	Barrow .	Barrow .	1880	17,267	5,460	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·88	40	..

z Includes Gun Mountings, &c.

y Propelling Machinery.

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Royal Naval Reserved Merchant Cruisers.

LIST OF VESSELS held by the Owners at the disposition of the Lords Commissioners of the Admiralty.

	Name.	Owners.	Length.	Breadth.	Maximum Draught of Water for the Admiralty List.	Gross Tonnage.	Average Ocean Speed.
			Feet.	Feet.	Feet.	Tons.	Knots.
With Subvention.	Etruria	Cunard Company	501·5	57·2	26	7,718	18½
	Umbria	,, ,,	501·5	57·2	26	7,718	18½
	Aurania	,, ,,	470	57·2	26	7,269	16½
	Victoria	Peninsular and Oriental Co.	466	52 ..	22½	6,300	15½*
	Britannia	,, ,, ,,	466	52	22½	6,300	15½*
	Oceana	,, ,, ,,	466	52	22½	6,300	15½*
	City of Paris 2 *s.*	Inman and International Co.	525	63½	24½	10,500	19
	City of New York 2 *s.*	,, ,, ,,	525	63½	24½	10,500	19
	†Majestic 2 *s.*	White Star Company	565	58	..	10,000	19
	†Teutonic 2 *s.*	,, ,,	565	58	..	10,000	19
	Britannic	,, ,,	455	45·2	25	5,004	15
	Germanic	,, ,,	455	45·2	25	5,008	15
	Adriatic	,, ,,	437·2	40·9	23	3,888	14
	Celtic	,, ,,	437·2	40·9	23	3,867	14
	Servia	Cunard Company	515	52·1	26	7,392	17
	Gallia	,, ,,	430·1	44·6	24	4,809	15
	Arcadia	Peninsular and Oriental Co.	466	52	22½	6,300	15½*
	Valetta	,, ,, ,,	420·4	45·1	22½	4,911	15½
	Massilia	,, ,, ,,	420·4	45·1	22½	4,908	15½
	Rome	,, ,, ,,	430·1	44·4	22½	5,013	15
	Carthage	,, ,, ,,	430·1	44·4	22½	5,013	15
	Ballarat	,, ,, ,,	420·2	43	22½	4,752	14½
	Parramatta	,, ,, ,,	420·2	43	22½	4,759	14½
	City of Berlin	Inman and International Co.	..	..	..	5,491	..
	City of Chicago	,, ,, ,,	..	..	..	5,202	..

There are numerous ships on the Admiralty List complying with Admiralty conditions as to subdivision which have no national tie. They are suitable for receiving an armament, but there is no arrangement with Owners, except the promise of preference for occasional State employment.

* Average speed of Britannia between Brindisi and King George's Sound, Western Australia. The average ocean speed is higher than this.

† A subvention will be paid on these vessels when they are completed for sea.

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Smaller Vessels, Gunboats.

Smaller Vessels, &c.

Note.—Troop and store ships, yachts, armed tugs, special service and harbour-service vessels, training ships, coast guard vessels, and small surveying vessels are not included.

Paddle-wheel Vessels. — Alecto, Cockatrice, Enchantress (late Helicon), Pioneer, Sphinx, Vigilant.

Old Type Gunboats.—Britomart, Cherub, Orwell, 330 tons; from 218 to 227 I.HP.

Twin Screw Gunboats (Iron).—Dee, Don, Esk, Medina, Medway, Sabrina, Slaney, Spey, Tay, Tees, Trent, Tweed, 363 tons; 320 to 410 I.HP.

Twin Screw Iron or Steel Gunboats (*Staunch Type*).—Ant, Arrow, Badger, Blazer, Bloodhound, Bonetta, Bouncer, Bulldog, Bustard, Comet, Cuckoo, Fidget, Gadfly, Griper, Hyæna, Insolent, Kite, Mastiff, Pickle, Pike, Pincher, Plucky, Scourge, Snake, Snap, Staunch, Tickler, Weasel, 180 to 254 tons; 130 to 270 I.HP.

For the unarmoured ships to be added to H.M. Navy, and those removed therefrom, between the 1st of April, 1889, and the 1st of April, 1894, see Parliamentary Returns on pages 155 and 622.

Torpedo Boats.

First Class.

19 of about 85 feet in length, 28 tons displacement, and 350 to 500 I.HP. of about 18 to 20 knots speed.
2 of about 100 feet in length, 40 tons displacement, and 350 to 500 I.HP. (at Esquimalt).
4 of about 110 to 113 feet in length, 63 to 67 tons displacement, and about 18½ to 20 knots speed.
48 of about 125 feet in length, 60 to 66 tons displacement, and 750 I.HP., and about 21 knots speed.
5 of about 125 feet in length, 85 tons displacement, and 750 I.HP.
1 of about 135 feet in length (Falke type), 87 tons displacement, and 1320 I.HP.
1 of about 150 feet in length (late Swift), 137 tons displacement, and about 1800 I.HP.
80

Six more are building, 130 feet long, with a guaranteed speed of 22½ knots.

They are to carry an armament of 3-pdr. quick-firing and machine guns, and three torpedo launching tubes.

Second Class.

51 of 60 to 66 feet in length, 12 tons displacement, and of 100 to 140 I.HP.
10 building of about the same length and of a new type with a guaranteed speed of 16 knots.

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TORPEDO BOATS (WOOD).

Smaller Vessels, &c.

12 of 56 feet in length, 11 tons displacement, and 150 I.HP.

The following vessels of various classes are noted in the official *Navy List* for January, 1889, as being non-effective for sea service, and mainly for sale:—

	Displacement.	I.HP.
Actæon (late Vernon)	830 ...	... Sailing (to be sold)
Algiers (late Anson)	5260	3583
Arab (Sloop)...	720	660 (to be sold)
Ariel (Gunboat)	438	540 (to be sold)
Beacon (Gun Vessel)	603	510 (to be sold)
Condor (Gun Vessel)	780	770 (to be sold)
Coquette (Gun Boat)	430	410 (to be sold)
Cygnet (Gun Boat)	455	530 (to be sold)
Daring (Screw Sloop)	940	920 (to be sold)
Defence (armour clad)... ...	6270	2540
Diamond (3rd class Cruiser)	1970	2140, since added
Enchantress (Yacht)	1000	1320 (to be sold)
Express (Gun Boat)	455	440 (to be sold)
Fantome (Screw Sloop) ...	940	970 (to be sold)
Flying Fish (Screw Sloop) ...	940	840 (to be sold)
Hart	603	610 (to be sold)
Lord Warden (armour clad)	7840	6700 (to be sold)
Lynx	603	530 (to be sold)
Mallard (Gun Boat)	455	400 (to be sold)
Monkey	212	373 (to be sold)
Mosquito (Gun Boat)	430	500 (to be sold)
Newcastle	4020	2354
Pert	603	500 (to be sold)
Repulse (armour clad)... ...	6190	3350 (to be sold)
Rocket	603	470 (to be sold)
Speedy (Gun Boat)	330	218 (to be sold)
Sprightly (Paddle)	234	214 (to be sold)
Victoria (3 decker)	6959	4191
Wards (Paddle Tug)	76	27 (to be sold)
Waterwitch (Ironclad Gunboat)	1280	730
Zephyr (Gun Boat)	438	530 (to be sold)

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Indian Marine.

(The ironclad ships Abyssinia and Magdala, belonging to the Indian Government, are included in the alphabetical list of Armoured Ships of the Royal Navy.)

Class of Ship.	Name.	Material of Construction.	Propellers.	Where Built.	When Launched	Length.	Breadth.	Draught of Water.	Displacement.	Indicated Horse-Power.	Speed.	Coal Storage.	Armament.
						ft. in.	ft. in.	ft. in.				Tons.	
Troop Ship .	Amberwitch	Iron .	1	Liverpool	1862	175 6	27 0	12 0	1,010	250	7·7	90	
Ditto . . .	Canning, was Golconda	Steel .	1	Glasgow	1882	285 0	36 2	16 8	3,300	1,080	10·6	400	
Ditto . . .	Clive . .	Iron and Steel	1	Birkenhead	1882	300 0	45 6	16 6	3,570	2,300	12·0	500	
Inland Steamer	Comet . .	Steel .	Pad.	..	..	..	..	..	144	190	..	..	Two 1-inch Nordenfelts.
Sailing Ship .	Czarewitch	Composite	..	Sunderland	1866	185 0	32 0	19 6	1,990				
Troop Ship .	Dalhousie .	Steel .	1	Greenock	B'lding.	239 6	36 0	15 7	1,960	1,500	13·0	300	Six 6-pr. Q.F. guns.
Surveying Ship	Investigator	Wood .	Pad.	Bombay	1881	180 0	25 8	11 3	856	660	10·5	105	
Inland Steamer	Irrawaddy	Iron .	Pad.	..	..	..	..	..	..	750	..	..	Two 20-prs. B.L.R.; two 9-prs. R.M.L.
Despatch Vessel	Lawrence .	Steel .	Pad.	Birkenhead	1886	212 2	32 2	18 3	1,154	1,200	13·5	270	Four 4-inch B.L.R.
Tug . . .	Madras .	Wood .	Pad.	Blackwall	1876	123 3	20 7	7 5	197	150 nom.	8·0	100	
Tug . . .	Manora .	Wood .	Pad.	Bombay	1869	141 5	26 0	12 1	420 B.M.	250	9·0	125	
Yacht . . .	May Frere	Wood .	Pad.	Bombay	1864	168 0	19 7	8 3	450	500	10·0	60	
Guard Ship .	Quangtung	Iron .	Pad.	Birkenhead	1863	185 3	24 7	11 3	900	520	..	160	Six 9-prs. R.M.L.
Inland Steamer	Sir Wm. Peel	Iron .	Pad.	..	..	..	..	..	302	600	..	..	Two 12-pr. Howitzers; four Nordenfelts M.G.
Inland Steamer	Sladen .	Steel .	Pad.	..	..	..	..	..	260	360	..	..	Two 12-pr. Howitzers; four Nordenfelts M.G.
Troop Ship .	Tenasserim	Iron .	1	London	1872	250 0	35 0	18 1	2,570	1,140	11·0	385	
Tug . . .	Undaunted	Iron .	Pad.	Dumbarton	1865	160 0	25 2	11 7	470	1,080	10·0	115	

India has had seven First Class Torpedo Boats of the latest type built in England, and they have only just left this country. For a description of them, see Chap. V. pp. 112 and 113.

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Colonial Marine (Great Britain).

(The Ironclad Turret-ship Cerberus, belonging to the Victorian Government, the five special second class Cruisers, and the two Torpedo Gun Boats of the Sharpshooter class for Australia are included in the alphabetical list of Ships of the Royal Navy.)

To what Government belonging.	Class of Ship.	Name.	Material of Construction.	Propellers.	Where Built.	When Launched.	Length.	Breadth.	Draught of Water.	Displacement.	Indicated Horse-Power.	Speed.	Coal Storage.	Armament.
							ft. in.	ft. in.	ft. in.				Tons.	
VICTORIA	Old line-of-battle ship	Nelson	Wood	1	Portsmouth	Converted 1860	216 3	54 6	..	4,096	2,102	10·0	..	Two 7-in. M.L.R.; 18 64-prs. M.L.R.; 12 32-prs.
	Gunboat	Albert	Steel	2	..	1883	115 0	25 0	10 0	350	400	10·0	..	One 8-in. 12-ton B.L.R.; one 6-in. 4-ton do.; two 9-prs. do.; two Nordenfelts.
	Gunboat	Victoria	Steel	2	..	1883	140 0	27 0	11 0	530	800	12·0	..	One 10-in. 25-ton B.L.R.; two 13-pr. B.L.R.; two 1-in. Nordenfelts.
	Gunboat	Batman	Iron	..	..	..	..	..	..	387	350	..	..	One 6-in. 4-ton B.L.R.; two Nordenfelts.
	Gunboat	Fawkner	Iron	..	..	..	..	..	..	387	350	..	..	One 6-in. 4-ton B.L.R.; two Gatlings.
	Gunboat	Gannet	Iron	..	..	..	..	..	..	346	500	..	..	One 6-in. 4-ton B.L.R.; two Nordenfelts.
	Gunboat	Lady Loch	..	..	..	..	..	..	..	..	..	..	..	One 6-in. 4-ton B.L.R.; two Nordenfelts.
	First class torpedo boat	Childers	Steel	1	Chiswick	1883	113 0	12 6	5 6	63	750	20·0	10	Two 1½-in. Hotchkiss guns.
QUEENSLAND	Gun-vessel	Gayundah	Steel	2	Glasgow	1884	115 0	25 0	10 0	360	400	10·0	..	One 8-in. 11½-ton B.L.R.; one 6-in. 4-ton do.; one 3-pr. Q.F.G.; two Nordenfelts.
	Gun-vessel	Paluma	Steel	2	Glasgow	1884	115 0	25 0	10 0	360	400	10·0	..	One 8-in. 11½-ton B.L.R.; one 6-in. 4-ton do.; one 3-pr. Q.F.G.; two Nordenfelts.
	Gunboat	Otter	Steel	2	..	..	..	..	..	220	460	..	..	One 64-pr. M.L.R.
	Gunboat	Bonito	Iron	2	..	..	..	..	..	450	400	..	..	.. ..
	Gunboat	Stingaree	Iron	2	..	..	..	..	..	450	400	..	..	.. ..
	Yacht	Lucinda	..	Pad.	..	..	..	..	..	..	..	..	..	.. ..
SOUTH AUSTRALIA	Cruiser	Protector	Steel	2	..	1884	188 0	30 0	12 6	920	1,640	14·0	..	One 8-in. 11½-ton B.L.R.; five 6-in. 4-ton do.; five Gatlings.

Note.—The Victorian Government also possesses two Second Class Steel Torpedo Boats and three Torpedo Launches; and the Queensland Government possesses one Second Class Steel Torpedo Boat.

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II.

FOREIGN ARMOURED AND UNARMOURED SHIPS.

THE principal dimensions and other details of the ships in the following lists have been in many cases extracted from the Austrian *Marine-Almanach*. They have in some cases been amended in accordance with Lord Charles Beresford's Parliamentary Return, No. 218, of 1888. With few exceptions all details concerning the ships of any nation have been printed either in the English naval periodicals or in the English newspapers, or in those of foreign countries. Where the latter sources of information failed, the deficiency has been made up from the *Navy Estimates* submitted to the several national Parliaments, and from other public official documents. It would have been impossible in every case to note the source from which each detail was derived without overburdening the pages with references and adding enormously to the size of the book.

The alphabetical arrangement of the ships in each of the two great divisions, armoured and unarmoured, has been followed so as to facilitate reference. There being now no uniform system of classifying the ships of all nations, an attempt has been made to assimilate as far as possible the classification of foreign fleets to that adopted in the British *Navy List*. Occasionally this has been only approximately practicable. It will be observed that the distinction between the smaller gun-*vessels* and the sea-going gun-*boats* is not always apparent, and the former term, applied by some nations to craft to which we apply the latter, has, for special reasons, been preserved.

The sketches of the ships are all drawn on the same scale (except in a few cases specially named), so that their relative sizes are apparent by inspection.

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The designation of foreign guns as a general rule by *centimetres* of calibre will permit easy reference to the Tables of Ordnance of the several powers. In general, it may be stated that, as every nation is engaged in either replacing its naval ordnance with new and improved pieces, or in rearranging the armament of individual ships, it has been only possible to republish the latest accessible information on the subject. The machine gun and torpedo armaments of every fleet vary continually.

ABBREVIATIONS.

A list of Abbreviations of the several classes of ships and vessels is placed at the head of each Table. The following refer to armaments throughout:—

B.L.R.	Breech-loading rifled gun.
M.L.R.	Muzzle „ „ „
l.	Light gun.
M.	Machine gun.
Q.F.	Quick-firing gun.
f. tu. / l. car	Fixed torpedo tube or launching carriage for White-head Torpedoes.
P.	Deck protected throughout.
pp.	Deck protected amidships.

} The protective decks in all cases are at least one inch thick.

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c.b., central-battery ship; *c.s.t.*, coast-service turret ship.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Endurance.	
					Belt.	Battery.					Guns.	Fish Torpedo Dischargers				Coals that can be carried in Bunkers.	At ten knots.
		Tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.b.	**Almirante Brown** (steel)	4200	240 0	50 0	9 (comp.)	8 (comp.)	11 & 8	20 6	2	4500	8 8-in. 11½-ton B.L.R., 6 4½-in. do. (Armstrong) 4 M.	..	1880	..	13·75	650	4300
c.s.t	**Andes**	1535	186 0	44 0	6	8 (turret)	11⅞	9 6	2	750	2 12½-ton Armstrong M.L.R., in turret, 2 lt. and 4 M.	..	1875	..	9·05	120	2880
„	**Plata**	1535	186 0	44 0	6	8 „	11⅞	9 6	2	750	2 12½-ton Armstrong R.L.R., in turret, 2 l.	..	1874	..	9·05	120	2880

It is understood that a large ironclad of above 7000 tons displacement is to be constructed in Europe.

ARGENTINE REPUBLIC.—Unarmoured Ships.

cr., cruiser; *g.v.*, gun-vessel.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Endurance.	
									Guns.	Fish Torpedo Dischargers				Coals that can be carried in Bunkers.	At ten knots.
			ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	**Argentina** . .	820	192 0	27 0	Steel	13 0	1	850	1 6-in. B.L.R., 6 7-cm. Krupp, 4 M. .	..	..	..	16·0	220	..
cr.	**Patagonia** . .	1530	220 0	32 10	Steel & wood	12 9	2	2400	1 10-in. B.L.R., 3 6-in. do., 6 l., 10 M. .	..	1885 at Trieste.	..	14·0	350	..
g.v.	**Parana** . . .	550	142 8	25 0	Iron	11 9	1	475	2 6½-ton M.L.R., 2 lt.	..	1874	..	11·0	..	..
„	**Uruguay** . .	550	142 8	25 0	Iron	11 9	1	475	2 6½-ton M.L.R., 2 lt.. . . .	..	1874	..	11·0	..	..

4 *Gunboats* (*Rendel type*), 416 tons, 420 I.H.P.; 4 1*st class Torpedo boats* (100 ft. long, of 600 I.H.P. and 20 knots speed); 4 *Spar Torpedo boats*; 1 *paddle Torpedo School vessel*, Maipu; 7 *screw steam vessels*; 6 *paddle-wheel vessels*, besides steam transports, and a sailing Corvette of 650 tons.

Two large protected cruisers of above 2000 tons displacement, and two torpedo gunboats are to be built shortly in Europe.

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The designation of foreign guns as a general rule by *centimetres* of calibre will permit easy reference to the Tables of Ordnance of the several powers. In general, it may be stated that, as every nation is engaged in either replacing its naval ordnance with new and improved pieces, or in rearranging the armament of individual ships, it has been only possible to republish the latest accessible information on the subject. The machine gun and torpedo armaments of every fleet vary continually.

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M.L.R.	Muzzle „ „ „
l.	Light gun.
M.	Machine gun.
Q.F.	Quick-firing gun.
f. tu. / l. car	Fixed torpedo tube or launching carriage for Whitehead Torpedoes.
P.	Deck protected throughout.
pp.	Deck protected amidships.

The protective decks in all cases are at least one inch thick.

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c.b., central-battery ship; *c.s.t.*, coast-service turret ship.

Class.	NAME.	Displacement.	Length.	Beam.	Armour. Belt.	Armour. Battery.	Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Endurance. Coals that can be carried in Bunkers.	Coal Endurance. At ten knots.
		Tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.b.	**Almirante Brown** (steel)	4200	240 0	50 0	9 (comp.)	8 (comp.)	11 & 8	20 6	2	4500	8 8-in. 11½-ton B.L.R., 6 4½-in. do. (Armstrong) 4 M.	..	1880	..	13·75	650	4300
c.s.t	**Andes**	1535	186 0	44 0	6	8 (turret)	11⅞	9 6	2	750	2 12½-ton Armstrong M L.R., in turret, 2 lt. and 4 M.	..	1875	..	9·05	120	2880
„	**Plata**	1535	186 0	44 0	6	8 „	11⅞	9 6	2	750	2 12½-ton Armstrong R.L.R., in turret, 2 l.	..	1874	..	9·05	120	2880

It is understood that a large ironclad of above 7000 tons displacement is to be constructed in Europe.

ARGENTINE REPUBLIC.—Unarmoured Ships.

cr., cruiser; *g.v.*, gun-vessel.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Endurance. Coals that can be carried in Bunkers.	Coal Endurance. At ten knots.
			ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	**Argentina** . .	820	192 0	27 0	Steel	13 0	1	850	1 6-in. B.L.R., 6 7-cm. Krupp, 4 M. .	..	..	..	16·0	220	..
cr.	**Patagonia** . .	1530	220 0	32 10	Steel & wood	12 9	2	2400	1 10-in. B.L.R., 3 6-in. do., 6 l., 10 M. .	..	1885 at Trieste.	..	14·0	350	..
g.v.	**Parana** . . .	550	142 8	25 0	Iron	11 9	1	475	2 6½-ton M.L.R., 2 lt.	..	1874	..	11·0	..	..
„	**Uruguay** . .	550	142 8	25 0	Iron	11 9	1	475	2 6½-ton M.L.R., 2 lt.. . . .	..	1874	..	11·0	..	..

4 *Gunboats* (*Rendel type*), 416 tons, 420 I.H.P.; 4 1*st class Torpedo boats* (100 ft. long, of 600 I.H.P. and 20 knots speed); 4 *Spar Torpedo boats*; 1 *paddle Torpedo School vessel*, Maipu; 7 *screw steam vessels*; 6 *paddle-wheel vessels*, besides steam transports, and a sailing Corvette of 650 tons.

Two large protected cruisers of above 2000 tons displacement, and two torpedo gunboats are to be built shortly in Europe.

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The designation of foreign guns as a general rule by *centimetres* of calibre will permit easy reference to the Tables of Ordnance of the several powers. In general, it may be stated that, as every nation is engaged in either replacing its naval ordnance with new and improved pieces, or in rearranging the armament of individual ships, it has been only possible to republish the latest accessible information on the subject. The machine gun and torpedo armaments of every fleet vary continually.

ABBREVIATIONS.

A list of Abbreviations of the several classes of ships and vessels is placed at the head of each Table. The following refer to armaments throughout:—

B.L.R.	Breech-loading rifled gun.
M.L.R.	Muzzle „ „ „
l.	Light gun.
M.	Machine gun.
Q.F.	Quick-firing gun.
f. tu. / l. car	Fixed torpedo tube or launching carriage for Whitehead Torpedoes.
P.	Deck protected throughout.
pp.	Deck protected amidships.

} The protective decks in all cases are at least one inch thick.

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c.b., central-battery ship; *c.s.t.*, coast-service turret ship.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Endurance.	
					Belt.	Battery.					Guns.	Fish Torpedo Dis-chargers				Coals that can be carried in Bunkers.	At ten knots.
		Tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.b.	Almirante Brown (steel)	4200	240 0	50 0	9 (comp.)	8 (comp.)	11 & 8	20 6	2	4500	8 8-in. 11½-ton B.L.R., 6 4½-in. do. (Armstrong) 4 M.	..	1880	..	13·75	650	4300
c.s.t	Andes	1535	186 0	44 0	6	8 (turret)	11⅞	9 6	2	750	2 12½-ton Armstrong M.L.R., in turret, 2 lt. and 4 M.	..	1875	..	9·05	120	2880
„	Plata	1535	186 0	44 0	6	8 „	11⅞	9 6	2	750	2 12½-ton Armstrong R.L.R., in turret, 2 l.	..	1874	..	9·05	120	2880

It is understood that a large ironclad of above 7000 tons displacement is to be constructed in Europe.

ARGENTINE REPUBLIC.—Unarmoured Ships.

cr., cruiser; *g.v.*, gun-vessel.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Endurance.	
									Guns.	Fish Torpedo Dis-chargers				Coals that can be carried in Bunkers.	At ten knots.
			ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	Argentina . .	820	192 0	27 0	Steel	13 0	1	850	1 6-in. B.L.R., 6 7-cm. Krupp, 4 M. .	..	..	..	16·0	220	..
cr.	Patagonia . .	1530	220 0	32 10	Steel & wood	12 9	2	2400	1 10-in. B.L.R., 3 6-in. do., 6 l., 10 M. .	..	1885 at Trieste.	..	14·0	350	..
g.v.	Parana . . .	550	142 8	25 0	Iron	11 9	1	475	2 6½-ton M.L.R., 2 lt.	..	1874	..	11·0	..	..
„	Uruguay . .	550	142 8	25 0	Iron	11 9	1	475	2 6½-ton M.L.R., 2 lt.. . . .	..	1874	..	11·0	..	..

4 *Gunboats* (*Rendel type*), 416 tons, 420 I.H.P.; 4 *1st class Torpedo boats* (100 ft. long, of 600 I.H.P. and 20 knots speed); 4 *Spar Torpedo boats*; 1 *paddle Torpedo School vessel*, Maipu; 7 *screw steam vessels*; 6 *paddle-wheel vessels*, besides steam transports, and a sailing Corvette of 650 tons.

Two large protected cruisers of above 2000 tons displacement, and two torpedo gunboats are to be built shortly in Europe.

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AUSTRIA.—Armoured Ships.

b., barbette ship; *br.*, broadside ship; *c.b.*, central-battery ship; *c.s.*, coast service ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Endurance.	
					Belt.	Battery or Turret.					Guns.	Fish Torpedo Dis-chargers				Coals that can be carried in Bunkers.	At 10 knots.
		Tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.b.	**Archduke Albert** (iron)	5940	285 2	56 3	9	7	9½	22 0	1	4060	8 24-c.m. B.L.R. 15½-ton Krupp, 6 9 c.m. Uchatius, 11 M., 2 l.	..	1872	357,600	13·00	453	1472
b.	**Archduke Ferdinand Max** Gunnery ship (wood)	5060	262 0	52 6	5	5	..	23 6	1	3500	14 18-c.m. Krupp, B.L., 4 9-c.m. Uchatius, 5 M., 2 l.	..	1865	..	12·50	330	..
b.	**Crown Prince Rudolph** (steel)	6900	295 0	62 4	12	11	..	25 3	2	6500	3 30½-c.m. 48-ton Kr., 6 12 c.m. 11 M, 2 l.	..	1887	330,000	14·00	600	..
c.b.	**Custoza** . (iron)	7060	302 3	58 0	9	7	8½	24 6	1	4820	8 26-c.m. 22-ton Krupp, 6 9 c.m. Uchatius, 11 M., 2 l.	..	1872	414,400	14·00	584	1624
c.b.	**Don Juan de Austria** (iron)	3550	240 3	50 0	8	6	9¾	20 0	1	2920	8 21-c.m. 10-ton Krupp, 6 9 c.m. Uchatius, 11 M., 2 l.	..	1875	..	13·50	380	2000
br.	**Habsburg** (wood)	5140	262 0	52 0	5	5	27⅞	23 9	1	3500	14 7-in. 6½-ton M.L.R. Armstrong, 4 9-c.m. Uchatius, 9 M., 2 l.	..	1865	280,672	12·00	330	..
c.b.	**Kaiser** . (wood)	5810	254 0	58 3	6	5½	31	24 3	1	3200	10 9-in. 12-ton Armstrong M.L.R., 6 9-c.m. Uch., 11 M., 2 l.	..	1871	337,200	13·00	450	1519
c.b.	**Kaiser Max** (iron)	3550	240 3	50 0	8	6	9¾	20 0	1	2890	8 21-c.m. 10 ton Krupp, 4 9 c.m. Uchatius, 11 M., 2 l.	..	1875	211,600	13·00	380	2000
c.b.	**Lissa** . (wood)	6080	288 3	56 9	6	5½	30	26 0	1	4200	12 24-c.m. 15½-ton Krupp, 4 9 c.m. Uchatius, 11 M., 2 l.	..	1869	412,800	13·00	490	1420
c.b.	**Prince Eugen** (iron)	3550	240 6	50 0	8	6	9¾	20 0	1	2960	8 21-c.m. 10-ton Krupp, 4 9 c.m. Uchatius, 11 M., 2 l.	..	1877	..	13·00	380	2000
b.	**Princess Imperial Stefanie** (was Archduke Ferdinand Max) (steel)	5150	278 10	55 9	9	8	..	21 6	2	6500	2 30½-c.m. 48-ton Krupp, 6 15 c.m. 5-ton Krupp, 11 M., 2 l.	..	1887	300,000	15·00	400	..
c.b.	**Tegetthoff** (iron & steel)	7390	286 11	71 1	14	14	9¾	24 10	1	6500	6 28-c.m. 27-ton Krupp, 6 9 c.m. Uchatius, 11 M., 2 l.	..	1878	?247,378	14·00	670	3300
River Monitor	**Leitha** (iron & steel)	310	166 0	27 6	1½	2½ (turret)	7½	3 7	2	320	2 15-c.m. Wahrendorf, 1 M.	..	1874	29,000	8·00	30	..

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corv., corvette; *fr. cr.*, frigate-built cruiser; *g. v.*, gun-vessel; *to. g. b.*, torpedo gunboat; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at knots.
									Guns.	Fish Torpedo Dischargers					
		Tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g. v.	**Albatross**	570	150 11	26 3	wood	11 2	1	580	2 15-c.m. 3-ton Wahrendorf, 1 l.	..	1873	..	10·00	60	..
fr. cr.	**Archduke Frederic**	1570	173 10	39 5	wood	16 9	1	780	14 15-c.m. 3-ton Wahrendorf, 1 l.	..	1874	..	9·00	200	..
corv.	**Aurora**	1340	190 6	32 10	composite	16 1	1	1170	4 15-c.m. 3-ton Wahrendorf, 1 l.	..	1873	..	11·00	160	..
to. g. b.	**Blitz**	350	193 6	22 4	steel	8 0	..	2600	9 Q.F.	..	1888	..	22·0	..	..
fr. cr.	**Donau**	2510	233 4	42 8	wood	19 8	1	1430	11 15-c.m. 5-ton Krupp, 1 l.	..	1874	..	12·00	320	..
Torpedo vessel.	**Seehund**	1550	224 0	34 0	steel	14 0	2	6200	2 12-c.m. 2½-ton Krupp, 10 Q.F. & M.	4 tu. or l.car	1886	..	18·50	250	..
corv.	**Fasana**	1970	223 3	39 5	wood	16 9	1	1750	4 15-c.m. 5-ton Krupp, 3 l.	..	1870	..	12·00	315	..
,,	**Frundsberg**	1340	190 6	32 10	composite	16 1	1	1260	4 15-c.m. 3-ton Wahrenrdorf, 1 l.	..	1873	..	11·00	160	..
,,	**Helgoland**	1820	226 6	36 2	wood	16 9	1	1860	5 15-c.m. 7-ton Krupp, 1 l.	..	1867	..	12·00	250	..
g. v.	**Hum**	900	173 10	29 6	wood	12 6	1	920	4 15-c.m. 3-ton Wahrendorf, 1 l.	..	1861	..	13·00	150	..
,,	**Kerka**	540	146 8	26 3	wood	11 2	1	300	2 15-c.m. 3-ton Wahrendorf, 1 l.	..	1860	..	9·00	50	..
to. g. b.	**Komet**	350	193 6	22 4	steel	8 0	..	2600	9 Q.F.	..	1888	..	22·0	..	..
fr. cr.	**Laudon**	3430	253 0	46 0	composite	20 8	1	2850	15 15-c.m. 5-ton Krupp, 7 M., 2 l.	..	1873	..	13·00	450	..
Torpedo cruiser	**Leopard**	1550	224 0	34 0	steel	14 0	2	6200	2 12-c.m. 2½-ton Krupp, 10 Q.F. & M.	4 tu. or l.car	1886	200,000	18·30	250	..
Torpedo vessel	**Lussin**	913	200 4	26 3	steel	12 2	2	2600	2 15-c.m. 5-ton Krupp, 7 M., 1 l.	..	1883	..	14·00	200	..
Torpedo rams	2 unnamed	about 4000	..	..	..	..	..	..	..	..	Bldg.	..	..	..	..

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AUSTRIA.—Unarmoured Ships—*continued.*

corv., corvette; *fr. cr.*, frigate-built cruiser; *g. v.*, gun-vessel; *to. g. b.*, torpedo gunboat; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at knots.
		Tons.	ft. in.	ft. in.		ft. in.						£	Knots.	tons.	knots.
to. g. b.	**Meteor**	350	187 0	22 4	steel	16 9	2	2600	2 12-c.m. 2½-ton B.L.R. Krupp, 10 Q.F. & M.	f. tu. or l.car	1887	..	22·0	120	..
g. v.	**Narenta**	540	147 8	26 3	wood	11 2	1	310	2 15-c.m. 3-ton Wahrendorf, 1 l.	..	1860	..	9·00	50	..
„	**Nautilus**	570	150 11	26 3	wood	11 2	1	410	2 15-c.m. 3-ton Wahrendorf, 1 l.	..	1873	..	9·00	60	..
Torpedo cruiser	**Panther**	1550	224 0	34 0	steel	14 0	2	6200	2 12-c.m. (35 cal.) 2½-ton Krupp, 10 Q.F. & M.	4 f. tu. or l.car	1885	..	18·50	250	..
to. g. b.	**Planet**	480	..	..	steel	..	..	3500	10 Q.F.	..	Bldg.	..	22·0	..	..
fr. cr.	**Radetzky**	3430	253 0	46 0	composite	20 8	1	3400	15 15-c.m. 5-ton Krupp, 7 M., 2 l.	..	1872	..	14·00	450	..
„	**Saida**	2440	233 4	42 8	wood	19 1	1	2010	11 15-c.m. 5-ton Uchatius, 1 l.	..	1878	..	12·00	320	..
g. v.	**Sansego**	350	111 7	23 0	wood	9 0	1	290	2 15-c.m. 3-ton Wahrendorf	..	1861	..	9·00	45	..
Torpedo vessel.	**Sebenico**	880	187 0	26 3	steel	12 2	2	2600	4 9-c.m. Uchatius, 2 M., 1 l.	..	1882	..	14·00	200	..
„	**Spalato**	840	179 6	26 3	steel	12 2	2	2600	4 9-c.m. Uchatius, 7 M., 1 l.	..	1879	..	14·00	150	..
Torpedo cruiser	**Tiger** ✓	1675	233 0	32 10	steel	15 5	2	5000	4 12-c.m., 2½-ton B.L.R., 10 M.	..	1887	..	18·0	300	..
to. g. b.	**Trabant**	480	..	..	steel	..	..	3500	10 Q.F.	..	Bldg.	..	..	..	..
Torpedo vessel	**Zara** (School ship)	840	179 6	26 3	steel	12 2	2	2600	4 9-c.m. Uchatius, 7 M., 1 l.	..	1879	..	14·00	150	..
corv.	**Zrinyi**	1340	190 6	32 10	composite	16 1	1	1170	4 15-c.m. 3-ton Wahrendorf, 1 l.	..	1871	..	11·00	160	..

Paddle-wheel vessels, Andreas-Hofer, Greif, Taurus, Trieste; two new gun-boats, the Gemse and Grille, of 320 tons displacement and 360 indicated horse-power; also Yachts, Harbour Service and Training Ships, Transports, &c.

Torpedo boats. Of the First Class, *eighteen* in number of the Falke and Habicht types, of 83 to 88 tons displacement, 800 to 900 I.H.P., and *five* of 83 tons displacement, and 1000 I.H.P. Each of them is armed with two machine guns; *twenty-six* of from 56 to 64 tons displacement, and 450 to 700 horse-power, 18 to 20 knots; and *eight* of 27 tons displ[illegible]

BELGIUM.

Though Belgium has no Navy properly so called, there are about a dozen steam vessels, principally employed as packets, which are under the orders of the Government, and of which several would be found useful under certain conditions of naval warfare. Seven of these steamers are of 578 tons.

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BRAZIL.—Armoured Ships.

c.b., central-battery ship; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery on Turret.					Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
River Monitor.	**Alagôas** . . (wood)	340	120 0	28 0	4½	4½ on turret	14½	4 10	2	180	1 70-pdr. Whitworth M.L.R.	..	1886	..	7·00		..
t.	**Aquidaban** (steel and wood sheathed)	4950	280 0	52 0	11 comp.	11½ comp., 10 comp. on turret	10	18 0	2	6200	4 9-in. 20-ton B.L.R. (Armstrong) 4 70-pdr. 5-ton do., 15 M.	5 f. tu. or l. car.	1885	345,000*	15·00	600	..
c.s., t.	**Bahia** . . (iron)	1000	178 0	35 0	4½	5½ on turret	10⅝	8 6	2	1640	2 7-in. M.L.R. (Whitworth) .	..	1865	..	10·00	..	..
c.s., c.b.	**Brazil** . . (iron)	1518	179 8	35 0	4½	4½ on turret	8	12 5	1	1500	4 7-in. M.L.R. (Whitworth), 4 68-pdr., 4 l., s b.	..	1864	60,000	11·30	..	..
t.	**Javary** . . (iron)	3700	240 0	58 0	12	13 on turret	9¾	11 5	2	2500	4 10-in. Whitworth M.L.R., 6 5-in. B.L.R., 5 M.	..	1875	..	11·20	200	680
c. s., t.	**Lima-Barros** . (iron)	1350	180 0	36 0	4½	4½ on turret	8¼	13 5	2	2100	4 7-in. Whitworth M.L.R. .	..	1866	..	12·00	200	..
cs., c.b.	**Mariz-e-Barros** (iron)	1444	198 10	36 0	4½	4½ on turret	8	10 10	2	600	4 7-in. Whitworth M.L.R. .	..	1866	..	9·00	..	..
River Monitor	**Piauhy** . . (wood)	340	120 0	28 0	4½	4½ on turret	14½	4 10	2	180	1 70-pdr. Whitworth M.L.R. .	..	1887	..	7·00	..	..
t.	**Riachuelo** (steel and wood sheathed)	5700	305 0	52 0	11 comp.	11 comp., 10 comp. on turret	10	19 6	2	7300	4 9-in. 20-ton B.L.R. (Whitworth, altered by Armstrong), 6 5½-inch 5-ton do., 15 M.	5 f. tu. or l. car.	1883	365,000*	16·71	800	4,500 (at 15 knots)
River Monitor	**Rio Grande** . (wood)	340	120 0	28 0	4½	4½ on turret	14½	4 10	2	180	1 70-pdr. Whitworth M.L.R. .	..	1888	..	7·00	..	..
c.b.	**Sete de Setembro** (wood)	2145	219 10	46 6	4½	4½	..	12 6	2	2000	4 9-in. 18-ton Whitworth M.L.R., 5 M.	..	1874	..	12·00	..	..
t.	**Solimões** . . (iron)	3700	240 0	58 0	12	13 on turret	9¾	11 5	2	2200	4 10-in. 25-ton Whitworth M.L.R., 5 M.	..	1875	..	11·20	200	680

* Exclusive of guns and ammunition.

NOTE.—The Brazil and Lima-Barros are now used as Stationary Floating Batteries.

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corv., corvette; *cr.*, cruiser; *g.v.*, gun-vessel; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
cr.	**Almirante Barroso** .	1960	213 5	36 2	composite	17 5	1	2200	7 5½-in. Whitworth B.L.R., 6 M. . .	..	1882	..	12·00	..	..
cr.	**Almirante Tamanderi** .	4023	270 0	46 0	steel (wood sheathed.)	18 4	2	7500	4 8-in. 12-ton B.L.R. (Armstrong), 12 6-in. 5-ton do., 16 M.	..	Bldng.	..	17.00	750	..
corv.	**Guanabàra** . . .	1900	200 0	41 2	wood	16 4	1	3000	9 70-pdr. Whitworth, 6 M. 2 l. . .	..	1877	..	13·00	..	..
cr.	**Imperial Marinheiro** . (used as a training vessel.)	726	167 0	26 3	composite	11 0	1	750	6 12-c.m. B.L.R., 1 9-c.m. do., 4 M. .	..	1883	..	9·00	..	..
cr. P.	New ship . . .	4030	..	..	steel	..	2	..	.. ..	..	Bldng.	..	..	..	..
corv.	**Nictheroy** . . .	1800	192 0	41 0	wood	16 0	1	1000	12 70-pdr. Whitworth, 6 M. . . .	..	1862	..	8·00	..	..
„	**Parnahyba** (Torpedo School ship)	838	170 6	26 3	composite	11 2	1	900	1 70-pdr. Whitworth 4M., 6 lt. . .	..	1878	..	10·00	..	..
cr.	**Primeiro de Março** .	726	167 3	26 3	composite	10 6	1	750	7 4½-in. Whitworth, B.L.R., 4 M. . .	..	1881	..	9·00	..	..
cr.	**Trajano**	1400	210 2	29 6	wood	14 9	1	2400	7 4½-in. Whitworth B.L.R., 4 M. . .	..	1873	..	13·00	..	..
corv.	**Vital de Oliveira** . .	1402	203 7	36 1	wood	13 2	1	1000	4 70-pdr. Whitworth	..	1867	..	..	..	..

Double-screw gunboats. — Guarany, Iniciadora, Pedro Affonso, Traripe, 250 to 330 tons; 160 to 260 I.H.P.

River-service gunboats. — Cabedello, Camocim, Cananéa, Carioca Marajó of 210 tons; 200 I.H.P.

Paddle river-service gunboats.—Braconnot, Lamego, Manáos, Taquary.

Paddle steamers.—Amazonas, Felippe Camarão, Fernandes Vieira, Henrique Diaz, Tramandahy, Vidal de Negreiros.

Torpedo boats.—Six first-class, built in England in 1882, of 110 ft. in length, and 12½ ft. in breadth, indicated horse-power 600, and speed 20 knots; sixteen of smaller size; second class and Spar Torpedo Boats.

Also Training and Harbour Ships and Transports.

NOTE.—Brazil has building a fast protected cruiser of 4020 tons displacement.

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BULGARIA.

This principality is already in possession of the nucleus of a naval force in a flotilla of eleven steamers of small size, of which one is used as the Prince's Yacht.

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CHILI.—Armoured Ships.

c. b., central-battery ship; *t.*, turret ship.

Class.	NAME.	Displacement.	Length.	Beam.	Armour. Belt.	Armour. Battery.	Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.b.	**Almirante Cochrane** (iron)	3500	210 0	45 9	9	8	7¾	19 8	2	2920	4 9-in. B.L.R. 18-ton Arm., 2 7-in. do., 7 M., 4 l.	..	1874	..	13·00	500	1900
c.b.	**Blanco Encalada** (iron)	3500	210 0	45 9	9	8	7¾	19 8	2	3000	6 12-ton Armstrong M.L.R., 7 M., 4 l.	..	1875	..	12·00	500	1900
t.	**Huascar** . . (iron)	1800	200 0	35 0	4½	5½ on turret	14	15 6	1	1050	2 10-in. 12½-ton Armstrong M.L.R., 2 40 pdr., 2 l.	..	1865	..	12·00	250	..
b.	New ship . (steel sheathed and coppered)	6900	328 0	60 8	12	..	..	21 10	2	11,000	.. ..	..	Bldg. in France	390,000	19·00	400	..

CHILI.—Unarmoured Ships.

corv., corvette; *cr.*, cruiser; P., deck protected throughout, *to.g.b.*, torpedo gunboat.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
corv.	**Abtao** (used as a transport.)	1050	227 0	29 6	composite	15 6	1	300 (nom.)	1 70-pr. B., 4 40-pr. B. Armstrong, 4 M.	..	1864	..	9·00	300	..
„	**Chacabuco** . .	1100	218 6	33 4	wood	17 4	1	1200	3 8-in., 2 70-pdrs., 4 40-pdr. (all B.L.R. Armstrong)	..	1866	..	10·00	400	..
cr.	**Esmeralda** P. (one inch thick)	3000	270 0	40 0	steel	18 3	2	6500	2 10 in. 25-ton Armstrong B.L.R., 6 M., 6-in. 4-ton. do., 2 Q.F., 6 M.	3 f. tu. or l.car	1883	..	18·28	600	2200
corv.	**Magellanes** . .	800	190 0	28 0	composite	14 9	2	1230	1 7-in. B.L.R., 1 64-pdr., 3 l. . .	..	1874	..	11·00	300	..
„	**O'Higgins** . .	1100	218 6	33 4	wood	17 4	1	1200	3 7-in. B.L.R. 4 40-pdr. B. (all Armstrong)	..	1866	..	10·00	500	..
„	**Pilcomayo** . .	600	171 0	27 4	wood	..	1	180 (nom.)	2 70-pdr., 2 40-pdr., 2 l. (all Armstrong)	..	1874	..	9·00	200	..
cr.	Two new ships . P	2080	268 0	35 9	steel	19 6	2	5400	.. ..	..	Bldg. in France		19·0		4500
to.g.b.	Two Sharpshooters .	735	230 0	27 0	steel	8 3	2	4500	.. ..	..	Bldg. in England		21·0	100	2500

Besides Sailing ships, there are—

Gunboats.—Five of 420 tons displacement and 7 to 10 knots speed.

Torpedo boats.—Eleven 1st class boats, mainly of 90 tons displacement, 100 feet in length, and a speed of 22 knots; 2 2nd class boats of 40 tons displacement, 50 feet long, and speed of 18 knots.

Despatch Vessel.—Amazonas.

Transport.—Angamos.

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CHINA.—Armoured Ships.

(The Chinese Navy is divided into Provincial Fleets: Canton, Foo-chow, Shang-hai, Peiho, and North Coast.)
a.g.b., armoured gunboat; *b.*, barbette ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Turret.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
b.	**Chen-Yuen** . (steel)	7430	308 5	59 0	14 comp.	12 comp.	14	20 0	2	6200	4 30½-c.m. 37-ton Krupp, 2 15-c.m. 4-ton do., 8 M., 2 l.	2 l. car.	1882	..	14·50	1000	..
b.	**King-Yuen** . (steel)	2850	270 0	40 0	9½	8 comp.	3-in. steel dk.	16 6	2	3600	2 8¼-in. 10-ton B.L.R., 2 6-in. do., 7 M.	1 f.tu.sb. 3 l. car.	1887	..	16·50	325	..
b.	**Lai-Yuen** . (steel)	2850	270 0	40 0	9½	8 comp.	3-in. steel dk.	16 6	2	3600	2 8¼-in. 10-ton B.L.R., 2 6-in. 4-ton do., 7 M.	1 f.tu.sb. 3 l. car.	1887	..	16·50	325	..
b.	**Ting-Yuen** . (steel)	7430	308 5	59 0	14 comp.	12 comp.	14	20 0	2	6200	4 30½-c.m. 37-ton Krupp, 2 15-c.m. 4-ton do., 8 M., 2 l.	2 l. car.	1881	..	14·50	1000	..
a.g.b.	**Tien-Sing** . (wood)	195	105 0	20 4	1⅛	3	5	7 0	2	340	1 17-c.m. Krupp . . .	..	1875	..	10·0	..	..

An armoured gunboat is building at Foo-chow.

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CHINA.—Unarmoured Ships.

cr., cruiser; *fr. cr.*, frigate-built cruiser; *g.v.*, gun-vessel; P., deck protected throughout; *pp*, partial deck protected; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
cr. P.	Chih-Yuen . . .	2300	250 0	38 0	steel	15 0	2	5500	3 8-in. 12-ton B.L.R., 2 6-in. 4-ton. do.	4 f. tu. or l.car	1886	..	18·00	450	..
„ P.	Ching-Yuen . . .	2300	250 0	38 0	steel	15 0	2	5500	3 8-in. 12-ton B.L.R., 2 6-in. 4-ton. do.	4 f. tu. or l.car	1886	..	18·00	450	..
„	Foo Chow . . .	1300	223 0	32 0	steel	13 3	2	1600	2 6-in. B L.R., 4 l.	..	1887	..	13·00	..	..
fr. cr.	Hai-An . . .	2630	300 0	42 0	wood	21 0	1	1750	2 21-c.m. Krupp, 20 12-c.m. do., 1 17-c.m. do.	..	1872	..	12·00	..	..
cr.	Huan-Tai . . .	1300	223 0	32 10	steel	13 3	2	1600	2 15-c.m. B.L.R. Krupp, 5 12-c.m. do., 4 M.	2 f. tu. or l.car	1888	..	15·0	..	..
cr.	Kai-Chih . . .	2480	259 0	39 4	steel	15 2	..	3000	1 25-c.m. B.L.R., 1 17-c.m. do., 6 15-c.m. do., 6 M.	..	..	..	15·00	..	..
g.v.	Mei-Yun . . .	578	170 0	22 9	composite	9 2	1	400	1 16-c.m. Vavasseur, 2 12-c.m. Vavasseur	..	1869	..	8·00	..	..
cr.	Nan-Schuin . . .	2200	253 0	36 2	steel	18 1	1	2400	2 8-in. 10-ton Armstrong B.L.R., 8 4½-in. do.	..	1884	..	15·00	..	..
„	Nan-Thin . . .	2200	253 0	36 2	steel	18 1	1	2400	2 8-in. 10-ton Armstrong B.L.R., 8 4½-in. do.	..	1883	..	15·00	..	..
„ *pp.*	Tshao-Yong . .	1350	210 0	32 0	steel	15 8	2	2677	2 10-in. 25-ton Armstrong B.L.R., 4 4½-in. do., 10 M., 2 l.	..	1881	..	16·80	300	5380 (at 8 knots)

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CHINA.—Unarmoured Ships—*continued.*

cr. cruiser; *fr. cr.* frigate-built cruiser; *g.v.* gun-vessel; P., deck protected throughout; *pp.* partial deck protected; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-Power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	**Tshen-Hai** . . .	578	160 10	26 3	wood	10 6	1	480	1 6½-ton Armstrong M.L.R., 6 l. . .	..	1872	..	10·00	..	..
cr. P.	**Tshi-Yuen** . . .	2355	236 3	34 5	steel	15 9	2	2800	2 21-c.m. (35 calibre) Krupp, 1 15-c.m. do., 4 l., 6 M.	4 tu.	1886	..	15·00	230	..
cr. P.	**Tsi-Yuen** . . .	2355	236 3	33 0	steel	15 9	2	2800	2 21-c.m. (35 calibre) Krupp, 1 15-c.m. do., 4 l., 6 M.	4 tu.	1886	..	15·0	230	..
g.v.	**Tsing-Yuen** . . .	578	160 10	26 3	wood	10 6	1	480	1 6½-ton Armstrong M.L.R., 6 l. . .	..	1872	..	10·00	..	..
cr.	**Yang-Tao** . . .	2500	253 0	36 2	composite	18 0	2	2400	3 8-in. 10-ton B.L.R., 7 4¾-in. do.	..	1883	..	15·00	..	..
„ *pp.*	**Yang-Wai** . . .	1350	210 0	32 0	steel	15 8	2	2580	2 10-in. 25-ton Armstrong B.L.R., 4 4½-in. do., 10 M., 2 l.	..	1881	..	16·00	300	5370 (at 8 knots)
„	**Ye-Sing** . . .	2500	253 0	36 0	composite	18 0	1	2400	3 8-in. 10-ton B.L.R., 7 4¾-in. do.	..	Bldg.	..	15·00	..	..

Cruisers.—One, of the Nan-Schuin type, is being built at Foo-chow, and one at Kiang-nan near Shang-hai; two, of 1600 tons and 2000 horse-power, are also now in course of construction.

Gunboats (*Rendel's System*).—Eleven of 325 to 440 tons displacement; 235 to 450 indicated horse-power, named with letters of Greek alphabet.

Gunboats (*Canton Flotilla*).—Thirteen of 100 to 350 tons displacement.

Floating Batteries.—Six with 3 12-ton Armstrong guns in a wooden fixed turret for river service.

Torpedo boats.—Twenty-two First-class, of which one is 160 ft. long, 19½ ft. broad, of 1500 horse-power, and 23 knots speed, and nine Second-class.

Also paddle-wheel vessels, transports, &c.

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b.c., bolted cruiser; *br.*, broadside ship; *c.s.*, coast-service vessel; *t.*, turret ship; f.tu., fixed tubes, and l. car., launching carriages for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour. Belt.	Armour. Battery or Turret.	Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers.	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
b.c.	**Absalon** . . (iron)	527	150 0	26 0	2½	2½	6	10 2	1	500	6 7½-c.m. B.L.R. Krupp, 2 M. .	..	1862	..	10·00	65	..
br.	**Denmark** . . (iron)	4747	270 0	49 6	4½	4½	18	19 10	1	1007	12 8-in. 9 ton Armstrong M.L.R., 12 6-in. Finspong M.L.	..	1864	260,000	8·00	625	..
Torpedo School Ship	**Esbern Snare** . (iron)	527	150 0	26 0	2½	2½	6	10 2	1	500	2 M.	1 f. tu. or l.car	1862	..	10·00	65	..
c.s., t.	**Gorm** . . . (iron)	2344	231 0	40 0	7	8 turret	10	14 0	2	1670	2 10-in. 18-ton Armstrong M.L.R., 3 8·7-c.m. Krupp, 4 M.	..	1870	104,000	12·25	115	..
t.	**Helgoland** . . (iron)	5347	257 6	59 2	12	10	10	18 8	2	4000	1 30½-c.m. 36-ton Krupp, 4 26-c.m. 22-ton do., 5 12½-c.m. do. 10 M.	4 f. tu. or l.car	1878	275,000	12·00	230	1070
b.	**Iver Hvitfeldt** (steel)	3260	242 0	49 6	12	8 on barbettes	..	18 0	2	5000	2 26-c.m. 28-ton Krupp, 6 12-c.m. do., 10 M.	4 f. tu. or l.car	1886	200,000	15·60	250	..
c.s., t.	**Lindormen** . . (iron)	2076	216 0	39 5	5	5 turret	9¾	13 9	2	1560	2 9-in. 13-ton Armstrong M.L.R., 3 8·7-c.m. Krupp 4 M.	..	1868	93,000	12·00	120	..
c.s., t.	New ship (2 turrets) (steel)	3290	..	..	..	..	..	..	2	..	2 28-ton B.L.R.	..	Bldng.	..	15·50	..	..
c.b.	**Odin** . . . (iron)	3083	237 0	50 0	8	8	10	15 6	1	2260	4 10-in. 18-ton Armstrong M.L.R., 4 8·7-c.m. Krupp B.L.R., 6 M.	..	1872	147,000	12·40	180	560
br.	**Peder Shram** . (wood) (Harbour Service)	3373	220 0	48 5	5	4½	..	20 7	1	1680	8 8-in. 9-ton Armstrong M.L.R., 8 6-in. Finspong, & 12·26 do.	..	1864	..	11·70	300	1589
t.	**Rolf Krake** . . (iron)	1344	185 2	38 3	4½	4½	9	10 6	1	750	2 8-in. 9-ton Armstrong, 2 8·7-c.m. Krupp, 4 M. . .	..	1863	74,000	7·80	135	..
Torpedo Ship	**Tordenskiold** . (steel)	2400	221 6	43 3	Armour on deck 4 in. to 2 in.	8 (steel)	..	15 6	2	2600	1 30½-c.m. 52-ton Krupp, 4 12-c.m. do., 8 M.	4 f. tu. or l.car	1880	138,900	14·00	170	..

NOTE.—A twin screw double turreted coast defence ironclad of 3290 tons displacement and 15½ knots speed, and having an armament of two 28-ton B. L. R. guns was laid down in 1888.

DENMARK.—Unarmoured Ships.

corv., corvette; *cr.*, cruiser; *fr. cr.*, frigate-built cruiser; *g.v.*, gun-vessel; P., deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Torpedoes.					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
corv.	**Dagmar** . . .	1193	173 10	33 10	wood	16 0	1	800	14 5½-in. 4¾-ton Krupp, 4 M. .	..	1861	50,000	9·50	150	..
g.v.	**Diana**	556	154 6	26 3	wood	10 2	1	500	6 7½-c.m. Krupp, 2 M. . .	..	1863	33,000	9·00	60	..
„	**Falster** . . .	356	111 0	28 10	iron	7 6	2	510	1 10-in. 20-ton Armstrong M.L.R., 2 7½-c.m. Krupp, 2 M. . .	..	1873	33,000	9·80	20	..
fr. cr.	**Fyen** . . . P.	2596	226 6	45 6	steel and iron wood sheathed	18 1	1	2700	4 long 15-c.m. 4¾-ton Krupp, 14 15-c.m. 3½-ton short do., 6 M.	2 f. tu. or l.car	1882	170,000	13·00	290	..
g.v.	**Fylla**	556	154 0	26 3	wood	10 2	1	500	6 7½-c.m. Krupp, 2 M. . . .	..	1862	33,000	9·00	60	..
cr. (3rd class)	**Geiser**	..	..	..	..	..	..	..	.. ..	..	Bldng.	..	..	..	..
corv.	**Heimdal** . . .	1192	173 10	31 6	wood	16 0	1	750	14 5½-in. Finspong, 2 M. . .	..	1856	..	9·00	..	..
cr.	**Hekla**	1280	233 0	32 10	steel	11 2	2	3000	6 long 15-c.m. Krupp, 10 M. .	..	Bldng.	..	17.00	..	..
g.v.	**Ingolf**	870	192 0	28 0	iron	12 6	1	670	2 15-c.m. Krupp, 4 7½-c.m. do., 2 M.	..	1876	44,000	10·50	130	..
fr. cr.	**Jylland** . . .	2457	200 3	44 3	wood	19 5	1	1350	20 6-in. Finspong M.L.R., 6 12-c.m. Krupp, 4 M.	..	1860	84,000	11·00	260	..
g.v.	**Moen**	356	111 0	28 10	iron	7 6	1	523	1 10-in. 20-ton Armstrong M.L.R., 2 8·7-c.m. Krupp, 2 M.	..	1875	..	9·20	20	..
corv.	**Saint Thomas** . .	1572	224 0	33 0	wood	17 0	1	1870	1 8-in. 9-ton Armstrong M.L.R., 4 12-c.m. Krupp, 3 M.	..	1871	..	13·00	190	..
cr.	**Valkyrien*** . P.	2900	268 0	43 6	steel	18 0	2	5000	2 long 21-c.m. 10-ton Krupp, 6 15-c.m. long 4¾-ton Krupp, 10 M.	5 f. tu. or l.car	1887	..	17·00	450	..

* 2¼ ins. steel deck under water through the whole length of the ship.

Gunboats.—Nine in number, of 150 to 240 tons; 200 to 400 indicated horse-power.

Torpedo boats.—Four sea-going, of 96 tons, 1300 indicated horse-power; of 35 to 65 tons displacement, and *second class*, nine, and thirteen to be built.

In addition there are [illegible]

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EGYPT.

Besides yachts, despatch vessels, and transports, there are on the list of the Egyptian Navy the following:—The Ibraichneih, a frigate of 4700 tons, 290 feet long, 50 feet broad, 19½ feet draught of water. The Mehemet Ali, a frigate of 1760 tons, 800 horse-power, and 28 guns. A wooden corvette, the Sakka, built in 1869, of 970 tons, 205 feet long, 37½ feet broad, 300 horse-power, and carrying 9 guns.

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FRANCE.—Armoured Ships.

a.c., armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length at Water Line.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery or Turret.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
a.g.b. & b.	**Achéron*** . (steel)	1640	181 0	40 4	8	8	..	11 10	2	1700	1 27-c.m. 28-ton B.L.R., 2 10-c.m. do., 2 M.	..	1885	100,000	13·00	..	..
c.b.	**Alma** (*d*) . (wood)	3770	229 10	46 6	5⅞	4¾	26	23 11	1	1896	6 19-c.m. B.L.R., 4 12-c.m. do.	..	1867	101,200	11·89	..	..
b.	**Amiral Baudin** . (iron & steel)	11,380	321 6	69 10	21½	16½ steel	14	26 2	2	8320	3 37-c.m. (75 ton) B.L.R., 12 14-c.m. do., 8 M.	f. tu.	1883	600,000	15·00	800	3000
b.	**Amiral Duperré** (iron & steel)	11,100	311 0	66 11	21½	15½	14	26 9	2	8000	4 34-c.m. (48 ton) B.L.R., 1 16-c.m. do., 14-c.m. do., 12 M.	f. tu. or l. car.	1879	570,000	14·22	..	..
c.b.	**Atalante** (*d*) (wood)	3800	229 10	46 6	6	4¾	26	23 3	1	1640	8 19-c.m. B.L.R., 4 12-c.m. do., 6 M.	..	1868	..	11·43	..	..
b.	**Bayard** . (wood)	6000	265 9	57 2	10	8	15	24 11	2	4000	4 24 c.-m. 16-ton B.L.R., 2 19-c.m. 8-ton do., 6 14-c.m. 3-ton do., 12 M., 2 l.	..	1880	..	14·00	400	..
c.s., t.	**Bélier** (*d*) . (wood)	3600	217 0	53 0	8½	7	31½	19 1	2	1921	2 24-c.m. 16-ton B.L.R. . .	..	1870	..	12·37	180	..
c.s.b.	**Belliqueuse** (*d*) (wood)	3706	230 0	46 3	6	4¾	26	22 10	1	1227	4 19-c.m. B.L.R., 4 16-c.m. do., 4 14-c.m. do., 6 M.	..	1865	99,176	11·78	..	..
c.s., t.	**Bouledogue** (*d*) (wood)	3400	217 0	53 0	8½	7	31½	18 2	2	1827	2 24-c.m. 16-ton B.L.R. . .	..	1872	..	12·25	180	..
b.	**Brennus** (steel)	10,826	344 6	65 0	17¦ comp.	17¼ comp.	..	27 10	3	5500	4 34-c.m. B.L.R., 10 14-c.m. do., 7 M.	..	Bldg.	..	18·00	..	..
c.s.b.	**Caiman** (iron and (steel)	7230	278 3	59 0	19½	17¾	12	24 7	2	8000	2 42-c.m. 75-ton B.L.R., 4 10-c.m. do., 4 M.	..	1885	..	14·50	500	..
c.s., t.	**Cerbère** (*d*) (wood)	3800	196 10	53 0	8½	7	31½	19 7	2	1800	2 24-c.m. 16-ton B.L.R. . .	..	1868	137,600	11·39	..	..
b.	**Charles Martel** (steel) (bldng. suspended)	10,650	344 0	64 0	17¼	17¼	..	26 9	3	5500	4 34-c.m. B.L.R., 8 14-c.m. do., 7 M.	..	..	..	15·00	..	..
a.g.b. & b.	**Cocyte** . (steel)	1640	181 0	40 4	8	8	..	11 10	2	1700	1 27-c.m. 28-ton B.L.R., 2 10-c.m. do., 2 M.	..	1887	100,000	13·00	..	..

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													3-ton do., 8 M.						
c.b. & b.	**Courbet** (iron & steel), formerly called Foudroyant.	9700	312	0	67	0	15	9½	..	25	0	2	8100	4 34-c.m. 48-ton B.L.R., 4 27-c.m. 28-ton do., 6 14-c.m. 3-ton do., 12 M.	4 f. tu. or l. car.	1881	800,000	14·20	628	3100
c.b. & b.	**Dévastation** (iron & steel)	10,100	312	0	67	0	15	9½	12½	25	0	2	8320	4 34-c.m. 48-ton B.L.R., 4 27-c.m. 23-ton do., 6 14-c.m. 3-ton do., 8 M.	4 f. tu. or l. car.	1879	..	15·17	610	2800
b.	**Duguesclin** (steel, sheathed with wood and coppered)	5869	266	0	57	0	9	8 barbettes compound	15	25	3	2	4100	4 24-c.m. 16-ton B.L.R., 1 19-c.m. 8 ton do., 6 14-c.m. 3-ton do., 2 Q.F., 12 M.	..	1883	220,000	14·00	400	..
a.c.	**Dupuy de Lôme**	6297	376	0	51	6	4	4	..	23	0	2	14,000	2 19-c.m. 8-ton B.L.R., 6 16-c.m. 5-ton do., 8 Q.F., 8 M.	4 f. tu. or l.car	Bldg.	Estimated 416,000	20·0	..	4000
a.c.	**Not Named** . .	6297	376	0	51	6	4	4	..	23	0	2	14,000	2 19-c.m. 8-ton B.L.R., 6 16-c.m. 5-ton do., 8 Q.F., 8 M.	4 f. tu. or l.car	Bldg.	do.	20·0	..	4000
a.g.b. & b.	**Flamme** . (special metal)	1045	165	0	32	7	10	4-in. shield	..	10	4	2	1500	1 24-c.m. 16-ton B.L.R., 1 9-c.m. do., 2 M.	1 f. tu.	1885	68,000	13·00	50	..
c.b.	**Flandre** (*d*) . (wood)	5997	295	3	56	6	6	4½	26	27	6	1	3536	8 24-c.m. B.L.R., 5 19-c.m. do., 6 M.	..	1864	213,280	13·30	..	..
b.	**Formidable** (steel)	11,441	321	6	69	6	21½	17¾	14	26	2	2	6500 8320 forced draught.	3 37-c.m. 75 ton B.L.R., 12 14-c.m. 3-ton do., 8 M.	f. tu.	1885	467,520 hull, 85,800 machinery.	15·00	600	..
c.b. & b.	**Friedland** . (iron)	8540	317	0	58	0	8	7	15	29	11	1	4428	8 27-c.m. 23-ton B.L.R., 8 14-c.m. 3-ton do., 1 12 c.m. do., 8 M.	2 f. tu. or l. car.	1873	..	13·30	630	..
c.s., t.	**Fulminant** (iron and steel)	5574	248	0	57	9	13	12	16	21	4	1	3550	2 27-c.m. 23-ton B.L.R., 4 12-c.m. do., 4 M.	2 l.car.	1877	..	13·22	275	..
c.s., b.	**Furieux** (iron & steel)	5700	247	10	59	0	20	17¾	..	21	9	2	4000	2 34-c.m. 48-ton B.L.R., 4 10-c.m., 4 M.	..	1883	264,610	14·00	290	1500
a.g.b. & b.	**Fusée** (steel, wood sheathed & coppered)	1045	165	0	32	7	10	4-in. shield	..	10	4	2	1500	1 24-c.m. 16-ton B.L.R., 1 9 c.m. do., 2 M.	1 f. tu.	1884	68,000	13·00	50	..
„	**Grenade** (steel wood sheathed & coppered)	1045	165	0	32	7	10	4-in. shield	..	10	4	2	1500	1 27-c.m. 16-ton B.L.R., 1 9-c.m. do., 2 M.	1 tu.	Bldg.	68,000	13·00	50	..
c.b.	**Héroine** . (iron)	5887	262	5	56	0	6	4½	26	27	7	1	3318	8 24-c.m. 16-ton B.L.R., 3 19-c.m. 8-ton do., 4 14-c.m. 3-ton do., 6 M.	..	1863	213,000	13·00	500	..
b.	**Hoche** (iron & steel)	10,581	330	0	65	7	18	16	..	27	3	2	7000	2 34-c.m. 52-ton B.L.R., 2 27-c.m. 28-ton do., 18 14-c.m. 3-ton do., 8 M.	4 f. tu. or l. car.	1886	380,000 hull, 120,000 machinery	15·00	600	4000

• The Achéron is built of steel; she has two screws, and an armoured belt at the water-line. Her 27-c.m. gun is carried on a barbette-turret.
(*d*) According to a statement made by the Minister of Marine the ships so marked are condemned as unfit for further service at sea.

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FRANCE.—Armoured Ships—*continued.*

a c., armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length at Water Line.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery or Turret.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
Armoured floating battery	**Imprenable** (*d*) (iron)	1420	129 6	51 10	5½	4½	16	11 3	2	411	2 24-c.m. B.L.R., 2 16-c.m. do., 2 12-c.m. do.	..	1867	..	5·51	..	..
c.s., b.	**Indomptable** (iron and steel)	7168	279 10	59 0	20	17½	..	23 6	2	6000	2 42-c.m. (75-ton) B.L.R., 4 10-c.m., 4 M.	..	1883	..	14·50	800	..
c.b. & b.	**La Galissonnière** (wood)	4700	255 8	49 0	6	4¾	26	23 9	2	2370	6 24-c.m. 16-ton B.L.R., 6 14-c.m. 3-ton do., 6 M.	..	1872	..	13·08	500	..
b.	**Magenta** (iron and steel)	10,581	330 0	65 7	18	16	..	27 3	2	7000	4 34-c.m. 52-ton B.R.L., 17 14-c.m. 3-ton do., 20 M.	4 f. tu. or l. car.	Bldg.	380,000 hull, 120,000 machinery.	15·00	600	4000
b.	**Marceau** (iron & steel)	10,581	330 0	65 7	18	16	..	27 3	2	7000	4 34-c.m. 52-ton B.L.R., 17 14-c.m. 3-ton do., 20 M.	4 f. tu. or l. car.	1887	380,000 hull, 120,000 machinery.	15·00	600	4000
c.b. & b.	**Marengo** . (wood)	7900	282 6	56 10	8	6¼	32	27 8	1	3673	4 27-c.m. 27-ton B.L.R., 4 24-c.m. 16-ton do., 7 12-c.m. do., 12 M.	..	1869	280,000	13·49	650	..
a.g.b. & b.	**Mitraille** (steel, wood sheathed and coppered) .	1045	165 0	32 7	10	4-in. shield	..	10 4	2	..	1 27-c.m. 16-ton B.L.R., 1 9-c.m. do., 2 M.	1 f. tu.	1886	70,000	13·00	50	..
c.b.	**Montcalm** (*d*) (wood)	3621	230 3	46 1	5⅞	4¾	26	23 7	1	1830	6 19-c.m. 8 ton B.L.R., 4 12-c.m., do., 8 M.	..	1868	..	11·65	..	..
b.	**Neptune** (iron & steel)	10,581	330 0	65 7	18	16 barbettes	..	27 3	2	7000	4 34-c.m. 52-ton B.L.R., 17 14-c.m. 2½-ton do., 20 M.	4 f. tu. or l. car.	1887	600,000 including armament	15·00	600	4000
c.b. & b.	**Océan** . (wood)	7500	282 6	56 10	8	6¼	32	27 3	2	3781	4 27-c.m. 23-ton B.L.R., 4 24-c.m. 16-ton do., 8 14-c.m. 3-ton do., 8 M.	..	1868	..	13·70	650	..
c.s., t.	**Onondaga** (*d*) (iron)	2600	228 4	51 2	5½	12¾	12	12 7	2	642	4 24-c.m. 16-ton B.L.R. .	..	1863	..	6·46	170	..
a.g. & b. b.	**Phlégéthon** (steel)	1640	181 10	40 4	8	8	..	11 10	2	1700	1 27-c.m. 28-ton B.L.R., 1 12-c.m. do., 2 M.	..	Bldg.	..	13·00	..	..
Armoured floating battery	**Protectrice** (*d*) (iron)	1420	129 6	51 10	5½	4½	15¾	12 0	2	..	4 19-c.m. 8-ton B.L.R., 1 l. .	..	1866	..	9·0	..	..

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c.b. & b.	**Redoutable**	(iron & steel)	9200	318	2 64	8	14	9½	15	25	6	2	6071	8 27-c.m. 24-ton B.L.R., 6 14-c.m. 3-ton. do., 8 M.	..	1876	..	14·66	510	2800
c.b.	**Reine Blanche** (*d*)	(wood)	3900	230	3 46	2	6	4¾	26	23	8	1	1860	6 16-c.m. 8-ton B.L.R., 4 12-c.m. 3-ton do., 6 M.	..	1868	..	11·80	250	..
c.s., b.	**Requin** .	(iron & steel)	7200	279	10 59	0	19½	17¾	..	24	7	2	6000	2 42-c.m. 75-ton B.L.R., 4 10-c.m. do., 4 M.	..	1885	..	14·00	500	..
c.b.	**Revanche** (*d*)	(wood)	5819	262	5 55	10	6	4½	26	27	1	2	3187	8 24-c.m. 16-ton B.L.R., 3 19-c.m. 8-ton do., 4 14-c.m. 3-ton do.	..	1865	..	13·25	500	..
c.b. & b. t	**Richelieu**	(wood)	9100	323	6 57	10	8½	6¼	..	27	11	2	4006	6 27-c.m. 23-ton B.L.R., 5 24-c.m. 16-ton do., 8 14-c.m. 3-ton do., 12 M.	..	1873	..	13·11	640	..
c.b.	**Savoie** (*d*) .	(wood)	6000	262	5 55	10	6	4½	26	28	0	1	3318	8 24-c.m. 16-ton B.L.R., 3 19-c.m. 4 14-c.m. do.	..	1864	..	13·47	..	..
a.g.b. & b.	**Styx** .	(steel)	1640	181	10 40	4	8	8	..	11	10	2	1700	1 27-c.m. 27-ton B.L.R., 1 12-c.m., 2 M.	..	Bldg.	..	13·00	..	..
c.b. & b.	**Suffren** .	(wood)	7600	282	6 57	10	8	6¼	32	29	10	1	4288	4 27-c.m. 23-ton B.L.R., 4 24-c.m. 9½-ton do., 6 14-c.m. 3-ton do., 12 M.	4 f. tu. or l. car.	1870	..	14·30	700	..
c.s., b.	**Taureau** (*d*)	(wood)	2700	194	9 47	3	6	4¾	26	17	9	2	1800	1 27-c.m. 24-ton B.L.R. . .	..	1865	..	12·54	170	..
c.s., t.	**Tempête**	(iron & steel)	4523	248	0 57	9	13	12	15¾	16	9	1	1745	2 27-c.m. 28-ton B.L.R., 4 M. .	..	1876	..	10·20	120	..
c.s., b.	**Terrible**	(iron & steel)	7200	279	10 59	0	19½	17¾	..	24	7	2	6000	2 42-c.m. 75-ton B.L.R., 4 10-c.m. do., 4 M.	..	1881	..	14·50	500	..
c.b.	**Thétis** (*d*) .	(wood)	3621	230	3 46	2	6	4¾	26	20	10	1	1859	6 19-c.m. 8-ton B.L.R., 4 14-c.m. do., 6 M.	..	1877	..	12·00	250	..
c.s., t.	**Tigre** (*d*) .	(wood)	3500	216	6 52	10	9	7	..	18	9	2	1880	2 24-c.m. 16-ton B.L.R. . .	..	1871	..	12·09	180	..
c.s., b.	**Tonnant**	(iron & steel)	4707	248	7 58	5	18	14½	15¾	17	3	1	1760	2 34-c.m. 48-ton B.L.R., 4 M. .	..	1880	..	11 00	120	..
c.s., t.	**Tonnerre**	(iron & steel)	5700	248	0 57	9	13	12	15¾	21	4	1	4165	2 27-c.m. 28-ton B.L.R., 4 10-c.m. 4 M.	..	1875	..	14·01	285	..
t.c. s. b.	**Trehonart** .	(steel)	6000	248	0 59	0	20	17¾	..	21	9	2	6800	2 34-c.m. 48-ton B.L.R., 4 Q.F., 10 M.	Building at Lorent.	..	..	..	..	..
c.b. & b.	**Trident** .	(wood)	8800	317	9 56	4	8½	6¼	34	29	1	1	4652	8 27-c.m. 23-ton B.L.R., 2 24-c.m. 16-ton do., 6 14-c.m. 3-ton do., 4 M.	2 f. tu. or l. car.	1876	..	14·17	540	..
„	**Triomphante**	(wood)	4700	258	2 48	9	6	4¾	26	22	5	1	2200	6 24-c.m. 16-ton B.L.R., 1 19-c.m. 8-ton do., 8 14-c.m. 3-ton do., 1 12-c.m. do.	..	1877	..	12·89	500	..

(*d*) According to a statement made by the Minister of Marine the ships so marked are condemned as unfit for further service at sea.

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FRANCE.—Armoured Ships—*continued.*

a.c., armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length at Water Line.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery or Turret.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
b.	**Turenne** . (wood)	6400	265 9	57 2	10	8	15	23 11	2	3955	4 24-c.m. 16-ton B.L.R., 2 19-c.m. 8-ton do., 6 14-c.m. 3-ton do., 12 M.	..	1879	..	14·14	400	..
c.b.	**Valeureuse**(*d*) (wood)	5774	262 5	56 4	6	4¼	..	27 6	1	3383	8 24-c.m. B.L.R., 1 19-c.m. 8-ton do., 6 16-c.m. do., 1 12-c.m. do.	..	1864	..	13·83	..	..
b.	**Vauban** . (steel)	5900	267 9	57 3	10	8	15	24 0	2	4060 (forced draught)	4 24-c.m. 16-ton B.L.R., 1 19-c.m. do., 6¼-c.m. 3-ton do., 12 M.	..	1882	..	14·32 forced draft.	400	..
c.s., t.	**Vengeur** (iron & steel)	4523	248 0	57 9	13	12	15¾	16 9	2	2319	2 34-c.m. 48-ton B.L.R., 4 M. .	..	1878	..	10·83	120	..
c.b. & b.	**Victorieuse** (wood)	4600	258 2	48 9	6	4¾	26	22 5	1	2214	6 24-c.m. 16-ton B.L.R., 1 19-c.m. 8-ton do., 4 14-c.m. 3-ton do., 2 10-c.m. do.	..	1875	..	12·75	300	..

(*d*) According to a statement by the Minister of Marine, the ships so marked are condemned as unfit for further service at sea.

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FRANCE.—Unarmoured Ships.

The divisions of the French unarmoured ships follow the official classification. The designation of each class is made, wherever practicable, to correspond with the usual parallel English equivalent. The French system of nomenclature is based on two distinct principles—that of the design of a ship, and that of the service for which a ship is intended. *Eclaireurs d'Escadre* are classed as sloops, that being the nearest English equivalent. *Avisos* are classed as despatch vessels to distinguish them from the *Canonnières de Station*, classed as gun-vessels, which they resemble more closely than they do the British Helicon. The *Canonnières de Station* differ little from British gun-*boats* of the Espoir class; they have been classed as gun-*vessels* to distinguish them from the several kinds of French gun-boats.

cr., cruiser; *d.v.*, despatch vessel; *fr.c.*, frigate-built cruiser; *g.v.*, gun-vessel; *sl.*, sloop; *to.cr.*, torpedo cruiser; *to.g.b.*, torpedo gun-boat; P. deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Dischargers for Torpedoes.					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
fr.c.	Alger P	4160	346 0	45 3	steel	19 6	2	8000	4 16-c.m. 5-ton B.L.R., 6 14-c.m. 3-ton do., 4 Q.F., 6 M.	4 f. tu. or l.car	Bldg.	..	19·00	..	..
fr.c.	Aréthuse	3100	277 6	43 6	wood	21 9	1	4200	4 16-c.m. 5-ton B.L.R., 22 14-c.m. 3-ton. do., 8 M.	..	1882	..	14·00	..	..
g.v.	Aspic	480	145 4	23 10	composite	10 6	1	453	2 14-c.m. 3-ton B.L.R., 2 10-cm. 24-cwt. do.	..	1880	..	10·30	..	..
sl.	Beautemps-Beaupré	1350	204 8	34 2	wood	15 10	1	985	6 14-c.m. 3-ton B.L.R., 4 M.	..	1872	..	12·60	..	..
d.v.	Bisson	880	199 5	28 5	wood	12 8	1	849	3 14-c.m. 3-ton B.L.R., 1 10-c.m. 24-cwt. do., 5 M.	..	1874	..	11·78	..	..
to.g.b.	Bombe	320	196 10	21 7	steel	5 11	2	1800	3 3-in. Q.F., 3 M.	2 f. tu. or l.car	1885	..	*18·00	..	..
sl.	Bougainville	800	182 0	31 9	wood	12 9	1	449	6 12-c.m. B.L.R.	..	1859	..	9·34	..	..
d.v.	Bourayne	1290	204 8	34 4	wood	15 10	1	768	6 14-c.m. B.L.R., 2 M.	..	1869	..	11·20	..	..
d.v.	Boursaint	780	198 4	28 0	wood	12 8	1	679	1 14-c.m. 3-ton B.L.R., 2 10-c.m. 3-ton do., 4 M.	..	1872	..	11·51	..	..
,,	Bouvet	870	197 6	28 0	wood	12 2	1	817	3 14-c.m. 3-ton B.L.R., 1 10-c.m. 24-cwt., do., 3 M.	..	1876	..	11·39	..	..

* Speed on measured mile 19·50.

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FRANCE.—Armoured Ships—*continued.*

a.c., armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length at Water Line.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery or Turret.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
b.	**Turenne** . (wood)	6400	265 9	57 2	10	8	15	23 11	2	3955	4 24-c.m. 16-ton B.L.R., 2 19-c.m. 8-ton do., 6 14-c.m. 3-ton do., 12 M.	..	1879	..	14·14	400	..
c.b.	**Valeureuse**(*d*) (wood)	5774	262 5	56 4	6	4¼	..	27 6	1	3383	8 24-c.m. B.L.R., 1 19-c.m. 8-ton do., 6 16-c.m. do., 1 12-c.m. do.	..	1864	..	13·83	..	..
b.	**Vauban** . (steel)	5900	267 9	57 3	10	8	15	24 0	2	4060 (forced draught)	4 24-c.m. 16-ton B.L.R., 1 19-c.m. do., 6 14-c.m. 3-ton do., 12 M.	..	1882	..	14·32 forced draft.	400	..
c.s., t.	**Vengeur** (iron & steel)	4523	248 0	57 9	13	12	15¾	16 9	2	2319	2 34-c.m. 48-ton B.L.R., 4 M. .	..	1878	..	10·83	120	..
c.b. & b.	**Victorieuse** (wood)	4600	258 2	48 9	6	4¾	26	22 5	1	2214	6 24-c.m. 16-ton B.L.R., 1 19-c.m. 8-ton do., 4 14-c.m. 3-ton do., 2 10-c.m. do.	..	1875	..	12·75	300	..

(*d*) According to a statement by the Minister of Marine, the ships so marked are condemned as unfit for further service at sea.

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FRANCE.—Unarmoured Ships.

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cr., cruiser; *d.v.*, despatch vessel; *fr.c.*, frigate-built cruiser; *g.v.*, gun-vessel; *sl.*, sloop; *to.cr.*, torpedo cruiser; *to.g.b.*, torpedo gun-boat; P. deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Dischargers for Torpedoes.					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
fr.c.	Alger P	4160	346 0	45 3	steel	19 6	2	8000	4 16-c.m. 5-ton B.L.R., 6 14-c.m. 3-ton do., 4 Q.F., 6 M.	4 f. tu. or l.car	Bldg.	..	19·00	..	..
fr.c.	Aréthuse	3100	277 6	43 6	wood	21 9	1	4200	4 16-c.m. 5-ton B.L.R., 22 14-c.m. 3-ton. do., 8 M.	..	1882	..	14·00	..	..
g.v.	Aspic	480	145 4	23 10	composite	10 6	1	453	2 14-c.m. 3-ton B.L.R., 2 10-cm. 24-cwt. do.	..	1880	..	10·30	..	..
sl.	Beautemps-Beaupré	1350	204 8	34 2	wood	15 10	1	985	6 14-c.m. 3-ton B.L.R., 4 M.	..	1872	..	12·60	..	..
d.v.	Bisson	880	199 5	28 5	wood	12 8	1	849	3 14-c.m. 3-ton B.L.R., 1 10-c.m. 24-cwt. do., 5 M.	..	1874	..	11·78	..	..
to.g.b.	Bombe	320	196 10	21 7	steel	5 11	2	1800	3 3-in. Q.F., 3 M.	2 f. tu. or l.car	1885	..	*18·00	..	..
sl.	Bougainville	800	182 0	31 9	wood	12 9	1	449	6 12-c.m. B.L.R.	..	1859	..	9·34	..	..
d.v.	Bourayne	1290	204 8	34 4	wood	15 10	1	768	6 14-c.m. B.L.R., 2 M.	..	1869	..	11·20	..	..
d.v.	Boursaint	780	198 4	28 0	wood	12 8	1	679	1 14-c.m. 3-ton B.L.R., 2 10-c.m. 3-ton do., 4 M.	..	1872	..	11·51	..	..
,,	Bouvet	870	197 6	28 0	wood	12 2	1	817	3 14-c.m. 3-ton B.L.R., 1 10-c.m. 24-cwt., do., 3 M.	..	1876	..	11·39	..	..

* Speed on measured mile 19·50.

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FRANCE.—Armoured Ships—*continued.*

a.c., armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length at Water Line.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery or Turret.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
b.	**Turenne** . (wood)	6400	265 9	57 2	10	8	15	23 11	2	3955	4 24-c.m. 16-ton B.L.R., 2 19-c.m. 8-ton do., 6 14-c.m. 3-ton do., 12 M.	..	1879	..	14·14	400	..
c.b.	**Valeureuse** (*d*) (wood)	5774	262 5	56 4	6	4¼	..	27 6	1	3383	8 24-c.m. B.L.R., 1 19-c.m. 8-ton do., 6 16-c.m. do., 1 12-c.m. do.	..	1864	..	13·83	..	..
b.	**Vauban** . (steel)	5900	267 9	57 3	10	8	15	24 0	2	4060 (forced draught)	4 24-c.m. 16-ton B.L.R., 1 19-c.m. do., 6¼-c.m. 3-ton do., 12 M.	..	1882	..	14·32 forced draft.	400	..
c.s., t.	**Vengeur** (iron & steel)	4523	248 0	57 9	13	12	15¾	16 9	2	2319	2 34-c.m. 48-ton B.L.R., 4 M. .	..	1878	..	10·83	120	..
c.b. & b.	**Victorieuse** (wood)	4600	258 2	48 9	6	4¾	26	22 5	1	2214	6 24-c.m. 16-ton B.L.R., 1 19-c.m. 8-ton do., 4 14-c.m. 3-ton do., 2 10-c.m. do.	..	1875	..	12·75	300	..

(*d*) According to a statement by the Minister of Marine, the ships so marked are condemned as unfit for further service at sea.

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FRANCE.—Unarmoured Ships.

The divisions of the French unarmoured ships follow the official classification. The designation of each class is made, wherever practicable, to correspond with the usual parallel English equivalent. The French system of nomenclature is based on two distinct principles—that of the design of a ship, and that of the service for which a ship is intended. *Eclaireurs d'Escadre* are classed as sloops, that being the nearest English equivalent. *Avisos* are classed as despatch vessels to distinguish them from the *Canonnières de Station*, classed as gun-vessels, which they resemble more closely than they do the British Helicon. The *Canonnières de Station* differ little from British gun-*boats* of the Espoir class; they have been classed as gun-*vessels* to distinguish them from the several kinds of French gun-boats.

cr., cruiser; *d.v.*, despatch vessel; *fr.c.*, frigate-built cruiser; *g.v.*, gun-vessel; *sl.*, sloop; *to.cr.*, torpedo cruiser; *to.g.b.*, torpedo gun-boat; P. deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Dischargers for Torpedoes.	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
fr.c.	Alger P	4160	346 0	45 3	steel	19 6	2	8000	4 16-c.m. 5-ton B.L.R., 6 14-c.m. 3-ton do., 4 Q.F., 6 M.	4 f. tu. or l.car	Bldg.	..	19·00	..	..
fr.c.	Aréthuse	3100	277 6	43 6	wood	21 9	1	4200	4 16-c.m. 5-ton B.L.R., 22 14-c.m. 3-ton. do., 8 M.	..	1882	..	14·00	..	..
g.v.	Aspic	480	115 4	23 10	composite	10 6	1	453	2 14-c.m. 3-ton B.L.R., 2 10-cm. 24-cwt. do.	..	1880	..	10·30	..	..
sl.	Beautemps-Beaupré	1350	204 8	34 2	wood	15 10	1	985	6 14-c.m. 3-ton B.L.R., 4 M.	..	1872	..	12·60	..	..
d.v.	Bisson	880	199 5	28 5	wood	12 8	1	849	3 14-c.m. 3-ton B.L.R., 1 10-c.m. 24-cwt. do., 5 M.	..	1874	..	11·78	..	..
to.g.b.	Bombe	320	196 10	21 7	steel	5 11	2	1800	3 3-in. Q.F., 3 M.	2 f. tu. or l.car	1885	..	*18·00	..	..
sl.	Bougainville	800	182 0	31 9	wood	12 9	1	419	6 12-c.m. B.L.R.	..	1859	..	9·34	..	..
d.v.	Bourayne	1290	204 8	34 4	wood	15 10	1	768	6 14-c.m. B.L.R., 2 M.	..	1869	..	11·20	..	..
d.v.	Boursaint	780	198 4	28 0	wood	12 8	1	679	1 14-c.m. 3-ton B.L.R., 2 10-c.m. 3-ton do., 4 M.	..	1872	..	11·51	..	..
,,	Bouvet	870	197 6	28 0	wood	12 2	1	817	3 14-c.m. 3-ton B.L.R., 1 10-c.m. 24-cwt., do., 3 M.	..	1876	..	11·39	..	..

* Speed on measured mile 19·50.

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FRANCE.—Unarmoured Ships—*continued.*

cr., cruiser; *d.v.*, despatch vessel; *fr.c.*, frigate-built cruiser; *g.v.*, gun vessel; *sl.*, sloop; *to.cr.*, torpedo cruiser; *to.g.b.*, torpedo gun-boat; P, deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Dischargers for Fish Torpedoes.					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	Capricorne	480	148 4	23 10	wood	10 5	1	443	2 14-c.m. 3-ton B.L.R., 2 10-c.m. 24 cwt. do.	..	1882	..	11·18	..	..
fr.c.	Cecille . . . . P.	5766	378 9	49 3	iron and steel	19 9	2	9600 (forced draught)	6 16-c.m. 5-ton B.L.R., 10 14-c.m. 3-ton do., 3 Q.F., 10 M.	4 f. tu. or l.car	1888	hull, 181,666; engines, 116,000.	19·00	..	..
g.v.	Chacal	460	142 6	24 4	wood	9 5	2	251	1 14-c.m. 3-ton B.L.R., 1 10-c.m., 24 cwt. do., 2 M.	..	1868	..	9·13	..	..
cr.	Champlain	2000	258 10	35 8	wood	16 0	1	1953	10 14-c.m. 3-ton do. . . .	..	1872	..	14·29	..	..
cr.	Chanzy . . . P. (Construction suspended)	3027	297 6	40 0	steel	17 6	2	9000	4 16-c.m. B.L.R., 4 Q.F., 6 M. .	4 f. tu. or l.car	Bldg.	..	20·00	480	4000 at 12½kts.
d.v.	Chasseur	930	199 5	28 5	wood & iron	12 7	1	850	4 14-c.m. 3-ton B.L.R. 4 M. 1 l. .	..	1878	..	11·06	..	..
cr.	Château Renault . .	1850	262 2	35 3	wood	18 2	1	1701	7 14-c.m. 3-ton B.L.R. . . .	..	1868	..	14·27	..	..
,,	Clorinde (Requires repair) .	1800	..	..	..	..	..	..	12 16-c.m. 5-ton B.L.R. . .	..	1857	..	10·00	..	..
cr.	Coetlogon . . . P.	1850	312 0	30 5	steel	14 0	2	6000	2 14-c.m. B.L.R, 3 Q.F., 4 M. .	5 f. tu. or l.car	Bldg.	..	19·50	200	2400
g.v.	Comete	495	151 6	24 9	composite	10 6	1	450	2 14-c.m. B.L.R., 2 10-c.m. do., 2 M.	..	1884	..	..	..	..
to.cr.	Condor	1280	216 6	29 3	steel	15 5	2	3800	5 10-c.m. 24 cwt. B.L.R., 6 M. .	5 f. tu. or l.car	1885	80,000	17·70	..	..
d.v.	Corse	520	148 7	27 11	wood	11 10	1	276	1 19-c.m. B.L.R., 2 10-c.m. do. .	..	1842	..	10·15	..	..
cr.	Cosmao . . . P.	1850	312 0	30 5	steel	14 0	2	6000	2 14-c.m. 3-ton B.L.R., 3 Q F., 4 M.	5 f. tu. or l.car	1888	..	19·50	200	2400
g.v.	Crocodile	450	141 10	24 0	composite	9 5	1	441	2 14-c.m. B.L.R.	..	1874	..	9·68	..	..
to.g.b.	Couleuvrine . . .	320	196 10	21 7	steel	5 11	2	1800	3 3-inch Q.F., 3 M. . . .	2 f. tu. or l.car	1885	..	18·00	..	..
,,	Dague	320	196 10	21 7	steel	5 11	2	1800	3 3-inch Q.F., 3 M. . . .	2 f. tu.	1885	..	18·00	..	..

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sl.	Dayot	1350	204	8	34	4	wood	15	10	1	917	1 16-c.m. 5-ton B.L.R., 5 14-c.m. do., 2 M.	..	1869	..	11·76	..	..
cr.	Decrès (Requires repair) .	1800	244	3	38	8	wood	18	2	1	1478	1 16-c.m. 5-ton B.L.R., 9 14-c.m. 3-ton do.	..	1866	..	12·04	..	..
cr.	Desaix	1700	259	2	34	8	wood	17	7	1	1442	4 10-c.m. B.L.R., 2 M. . . .	..	1866	..	14·21	..	..
„	D'Estaing	2400	262	5	37	5	wood & iron	18	8	1	3700	15 14-c.m. 3-ton B.L.R., 10 M. .	..	1879	..	15·31	..	..
sl.	D'Estrées (Requires repair) .	1340	207	4	34	0	wood	15	9	1	1003	1 16-c.m. 5-ton B.L.R., 5 14-c.m. 3-ton do., 2 M.	..	1867	..	12·30	..	..
to.g.b.	Dragonne . . .	320	196	10	21	7	steel	5	11	2	1800	3 3-inch Q.R., 3 M. . . .	2 f. tu. or l.car	1885	..	18·00	..	..
fr.c.	Dubourdieu . . .	3400	253	7	46	6	wood	22	10	1	3300	4 16-c.m. 5-ton B.L.R. 14 14-c.m. 3-ton B.L.R.	1 f. tu. or l.car	1884	hull, 95,833; machinery, 30,720; equipment, 28,000.	14·00	..	..
sl.	Duchaffault . . .	1340	204	8	34	2	wood	16	0	1	1214	6 14-c.m. 3-ton B.L.R., 2 M. . .	..	1872	..	12·72	..	..
„	Ducouedic . . .	1340	204	8	34	2	wood	16	6	1	769	6 14-c.m. 3-ton B.L.R., 2 M. . .	..	1869	..	11·57	..	..
cr.	Duguay Trouin . . .	3300	296	3	43	4	iron & wood	20	6	1	3740	5 19-c.m. 8-ton B.L.R., 5 14-c.m. 3-ton. do.	2 f. tu. or l.car	1877	..	15·90	430	..
g.v.	Dumont d'Urville .	860	201	11	28	6	wood	13	8	1	850	4 14 c.m. 3-ton B.L.R. . . .	..	1878	..	11·60	..	..
cr.	Du Petit Thouars . .	2000	257	10	35	9	wood	16	0	1	2018	10 14-c.m. 3-ton B.L.R. . . .	..	1874	..	15·07	..	..
„	Dupleix	1850	210	0	37	5	wood	18	0	1	1215	12 14-c.m. 3-ton B.L.R. . .	..	1861	..	11·47	..	..
fr.cr.	Duquesne	5800	333	5	50	3	iron & wood	25		1	6589	7 19-c.m. 8-ton B.L.R., 14 14-c.m. 3-ton do., 8 M. 1 l.	..	1876	..	16·90	600	..
cr.	Éclaireur	1830	236	3	35	5	iron & wood	17	0	1	2050	8 14-c.m. 3-ton B.L.R., 2 M. . .	..	1877	..	15·00	..	..
to.cr.	Epervier	1280	216	6	29	3	steel	15	5	2	3200	5 10-c.m. B.L.R., 6 M. . . .	5 f. tu. or l.car	1885	80,000	17·00	..	..

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FRANCE.—Unarmoured Ships—*continued.*

cr., cruiser; *d.v.*, despatch vessel; *fr.c.*, frigate-built cruiser; *g.v.*, gun vessel; *sl.*, sloop; *to.cr.*, torpedo cruiser; *to.g.b.*, torpedo gun-boat; P, deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	Etendard	510	142 6	24 4	wood	9 5	2	232	1 19-c.m. B.L.R., 1 12-c.m. do. .	..	1868	..	9·00	..	..
g.v.	Etoile	450	149 3	24 7	composite	8 4	2	450	2 14-c.m. 3-ton B.L.R., 2 10-c.m. do., 2 M.	..	1885	..	10·00	..	..
cr.	Fabert	2100	249 4	36 0	wood	18 4	1	1107	8 14-c.m. 5-ton B.L.R. . . .	..	1874	..	12·42	..	..
g.v.	Fanfare	510	142 0	24 4	wood	9 5	2	233	1 19-c.m. B.L.R., 1 12-c.m. do. .	..	1868	..	8·39	..	..
to.cr.	Faucon	1280	216 6	29 3	steel	15 5	2	3200 (forced draught)	5 10-c.m. B.L.R., 6 M. . .	5 f. tu. or l.car	1887	80,000	17·5	..	..
to.g.b.	Fleche	320	196 10	21 7	steel	5 11	2	1800	3 3-inch Q.F., 3 M. . . .	2 f. tu. or l.car	1885	..	18·00	..	..
cr.	Forbin . . . P.	1850	312 0	30 5	steel	16 0	2	6000	2 14-c.m. 3-ton B.L.R., 3 Q.F., 4 M .	5 f. tu. or l.car	1888	..	19·50	200	2400
cr.	Forfait	2400	249 4	38 0	wood & iron	18 0	1	2764	15 14-c.m. 3-ton B.L.R., 2 l., 6 M. .	..	1879	..	13·44	..	..
g.v.	Fulton	825	199 5	28 5	wood	12 8	1	850	4 14-c.m. 3-ton B.L.R. . . .	..	1887	37,000	13·00	..	..
„	Gabes	490	151 6	24 9	„	10 6	1	450	2 14-c.m. B.L.R., 2 10-c.m. do., 2 M.	..	1884	..	11·00	..	..
„	Gabriel Charmes . .	474	142 0	24 5	composite	9 5	1	443	1 14-c.m. 3 ton B.L.R. . . .	..	1885	..	11·00	..	..
„	Gladiateur . . .	490	142 0	24 4	wood	9 5	2	218	1 14-c.m. B.L.R., 1 12-c.m. do., 2 M.	..	1868	..	9·50	..	..

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d.v.	Guichen																		
sl.	Hamelin			1340	207	7	34	2	„	15	10	1	1155	1 16-c.m. B.L.R., 5 14-c.m. B.L.R., 2 M.	..	1866	..	12·58	..	..
d.v.	Hirondelle			1040	249	6	30	4	wood	12	8	2	1780	2 19-c.m. 24-cwt. B.L.R.	..	1869	..	15·50	..	..
sl.	Hugon			1340	204	5	34	2	„	15	10	1	1054	6 14-c.m. 3-ton B.L.R., 2 M.	..	1872	..	11·72	..	..
d.v.	Hussard			880	201	10	28	6	„	13	7	1	850	4 14-c.m. 3-ton B.L.R.	..	1877	..	12·08	..	..
g.v.	Hyène			470	142	0	24	5	„	9	5	2	258	1 14-c.m. B.L.R., 1 10-c.m. do.	..	1868	..	9·06	..	..
d.v.	Inconstant			825	199	5	28	5	„	12	7	1	850	4 14-c.m. 3-ton B.L.R.	..	1886	37,000	13·00	..	..
cr.	Infernet			1931	262	2	35	9	„	18	4	1	1815	8 14-c.m. 3-ton B.L.R.	..	1869	..	13·90	..	..
fr.c.	Iphigénie			3200	244	6	46	6	„	22	4	1	2800	2 16-c.m. 5-ton B.L.R., 18 14-c.m. 3-ton do., 10 M., 3 l.	..	1881	..	14·60	..	..
fr.cr.	Isly		P	4160	346	0	43	6	steel	19	6	2	8000	4 16-c.m. 5-ton B.L.R., 6 14-c.m. 3-ton do., 4 Q.F., 6 M.	4 f. tu. or l.car	Bldg.	..	19·00	..	..
g.v.	Jaguar			460	142	0	24	5	wood	9	5	2	270	1 14-c.m. B.L.R., 1 12-c.m. do., 2 M.	..	1868	..	9·37	..	..
Torpedo Depôt Ship.	Japon			3970	..		..		..	..		1	1500	1 14-c.m. 3-ton B.L.R., 1 10-c.m. do.	..	1859	..	12·4	..	..
fr.c.	Jean Bart		P	4160	346	0	43	6	steel	19	6	2	8000	4 16-c.m. 5-ton B.L.R., 6 14-c.m. 3-ton do.	4 f. tu. or l.car	Bldg.	..	19·00	..	..
sl.	Kerguelen			1340	204	5	34	2	wood	15	10	1	1200	6 14-c.m. 3-ton B.L.R., 2 M.	..	1872	..	12·76	..	..
d.v.	Labourdonnais			860	199	5	28	5	„	12	7	1	787	4 14-c.m. 3-ton B.L.R.	..	1875	..	11·69	..	..
cr.	Laclocheterie			2100	262	2	35	9	„	18	4	1	1918	8 14-c.m. 3-ton B.L.R., 2 l.	..	1872	..	13·73	300	..
„	Lalande		P.	1877	311	6	31	2	steel	14	0	2	6000	2 14 c.m. B.L.R., 3 Q.F., 4 M.	5 f. tu. or l.car	1888	..	19.50	200	2400
to.g.b.	Lance			320	196	10	21	7	„	5	11	2	1800	3 3-inch Q.F., 3 M.	2 f. tu. or l.car	1886	..	18·00	..	..
cr.	Lapérouse			2400	262	5	37	5	wood & iron	18	8	1	2280	15 14-c.m. 3-ton B.L.R., 6 M., 2 l.	..	1877	..	14·73	..	..
sl.	Limier			1330	207	4	34	0	„	15	10	1	1084	6 14-c.m. 3-ton B.L.R., 2 M.	..	1866	..	11·80	..	..
„	Linois (Requires repair)			1210	203	5	32	2	„	15	2	1	720	6 14-c.m. 3-ton B.L.R., 2 M.	..	1867	..	11·50	..	..
g.v.	Lion			470	151	6	24	9	composite	10	6	1	400	2 14-c.m. 3-ton B.L.R., 2 10-c.m. do., 2 M.	..	1884	..	11·00	..	..
„	Lionne			500	141	9	23	11	„	9	6	1	426	1 14-c.m. B.L.R., 2 M., 2 l.	..	1877	..	9·81	..	..
„	Lutin			490	141	9	23	11	„	9	4	1	427	2 14-c.m. B.L.R., 2 l.	..	1877	..	10·00	..	..
„	Lynx			485	141	9	23	11	„	9	4	1	427	2 14-c.m. B.L.R., 2 l.	..	1878	..	10·38	..	..

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FRANCE.—Unarmoured Ships—*continued.*

cr., cruiser; *d.v.*, despatch vessel; *fr.c.*, frigate-built cruiser; *g.v.*, gun vessel; *sl.*, sloop; *to.cr.*, torpedo cruiser; *to.g.b.*, torpedo gun-boat; P, deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	Etendard	510	142 6	24 4	wood	9 5	2	232	1 19-c.m. B.L.R., 1 12-c.m. do. .	..	1868	..	9·00	..	..
g.v.	Etoile	450	149 3	24 7	composite	8 4	2	450	2 14-c.m. 3-ton B.L.R., 2 10-c.m. do., 2 M.	..	1885	..	10·00	..	..
cr.	Fabert	2100	249 4	36 0	wood	18 4	1	1107	8 14-c.m. 5-ton B.L.R. . . .	..	1874	..	12·42	..	..
g.v.	Fanfare	510	142 0	24 4	wood	9 5	2	233	1 19-c.m. B.L.R., 1 12-c.m. do. .	..	1868	..	8·39	..	..
to.cr.	Faucon	1280	216 6	29 3	steel	15 5	2	3200 (forced draught)	5 10-c.m. B.L.R., 6 M. . .	5 f. tu. or l.car	1887	80,000	17·5	..	..
to.g.b.	Fleche	320	196 10	21 7	steel	5 11	2	1800	3 3-inch Q.F., 3 M. . . .	2 f. tu. or l.car	1885	..	18·00	..	..
cr.	Forbin . . . P.	1850	312 0	30 5	steel	16 0	2	6000	2 14-c.m. 3-ton B.L.R., 3 Q.F., 4 M .	5 f. tu. or l.car	1888	..	19·50	200	2400
cr.	Forfait	2400	249 4	38 0	wood & iron	18 0	1	2764	15 14-c.m. 3-ton B.L.R., 2 l., 6 M. .	..	1879	..	13·44	..	..
g.v.	Fulton	825	199 5	28 5	wood	12 8	1	850	4 14-c.m. 3-ton B.L.R. . . .	..	1887	37,000	13·00	..	..
„	Gabes	490	151 6	24 9	„	10 6	1	450	2 14-c.m. B.L.R., 2 10-c.m. do., 2 M.	..	1884	..	11·00	..	..
„	Gabriel Charmes . .	474	142 0	24 5	composite	9 5	1	443	1 14-c.m. 3 ton B.L.R. . . .	..	1885	..	11·00	..	..
„	Gladiateur . . .	490	142 0	24 4	wood	9 5	2	218	1 14-c.m. B.L.R., 1 12-c.m. do., 2 M.	..	1868	..	9·50	..	..

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														3-ton do.					
sl.	**Hamelin**				1340	207	7	34	2	„	15	10	1	1155	1 16-c.m. B.L.R., 5 14-c.m. B.L.R., 2 M.	..	1866	..	12·58	..	..
d.v.	**Hirondelle**				1040	249	6	30	4	wood	12	8	2	1780	2 19-c.m. 24-cwt. B.L.R.	..	1869	..	15·50	..	..
sl.	**Hugon**				1340	204	5	34	2	„	15	10	1	1054	6 14-c.m. 3-ton B.L.R., 2 M.	..	1872	..	11·72	..	..
d.v.	**Hussard**				880	201	10	28	6	„	13	7	1	850	4 14-c.m. 3-ton B.L.R.	..	1877	..	12·08	..	..
g.v.	**Hyène**				470	142	0	24	5	„	9	5	2	258	1 14-c.m. B.L.R., 1 10-c.m. do.	..	1868	..	9·06	..	..
d.v.	**Inconstant**				825	199	5	28	5	„	12	7	1	850	4 14-c.m. 3-ton B.L.R.	..	1886	37,000	13·00	..	..
cr.	**Infernet**				1931	262	2	35	9	„	18	4	1	1815	8 14-c.m. 3-ton B.L.R.	..	1869	..	13·90	..	..
fr.c.	**Iphigénie**				3200	244	6	46	6	„	22	4	1	2800	2 16-c.m. 5-ton B.L.R., 18 14-c.m. 3-ton do., 10 M., 3 l.	..	1881	..	14·60	..	..
fr.cr.	**Isly**			P	4160	346	0	43	6	steel	19	6	2	8000	4 16-c.m. 5-ton B.L.R., 6 14-c.m. 3-ton do., 4 Q.F., 6 M.	4 f. tu. or l.car	Bldg.	..	19·00	..	..
g.v.	**Jaguar**				460	142	0	24	5	wood	9	5	2	270	1 14-c.m. B.L.R., 1 12-c.m. do., 2 M.	..	1868	..	9·37	..	..
Torpedo Depôt Ship.	**Japon**				3970	..		..		..	..		1	1500	1 14-c.m. 3-ton B.L.R., 1 10-c.m. do.	..	1859	..	12·4	..	..
fr.c.	**Jean Bart**			P	4160	346	0	43	6	steel	19	6	2	8000	4 16-c.m. 5-ton B.L.R., 6 14-c.m. 3-ton do.	4 f. tu. or l.car	Bldg.	..	19·00	..	..
sl.	**Kerguelen**				1340	204	5	34	2	wood	15	10	1	1200	6 14-c.m. 3-ton B.L.R., 2 M.	..	1872	..	12·76	..	..
d.v.	**Labourdonnais**				860	199	5	28	5	„	12	7	1	787	4 14-c.m. 3-ton B.L.R.	..	1875	..	11·69	..	..
cr.	**Laclocheterie**				2100	262	2	35	9	„	18	4	1	1918	8 14-c.m. 3-ton B.L.R., 2 l.	..	1872	..	13·73	300	..
„	**Lalande**			P.	1877	311	6	31	2	steel	14	0	2	6000	2 14 c.m. B.L.R., 3 Q.F., 4 M.	5 f. tu. or l.car	1888	..	19.50	200	2400
to.g.b.	**Lance**				320	196	10	21	7	„	5	11	2	1800	3 3-inch Q.F., 3 M.	2 f. tu. or l.car	1886	..	18·00	..	..
cr.	**Lapérouse**				2400	262	5	37	5	wood & iron	18	8	1	2280	15 14-c.m. 3-ton B.L.R., 6 M., 2 l.	..	1877	..	14·73	..	..
sl.	**Limier**				1330	207	4	34	0	„	15	10	1	1084	6 14-c.m. 3-ton B.L.R., 2 M.	..	1866	..	11·80	..	..
„	**Linois** (Requires repair)				1210	203	5	32	2	„	15	2	1	720	6 14-c.m. 3-ton B.L.R., 2 M.	..	1867	..	11·50	..	..
g.v.	**Lion**				470	151	6	24	9	composite	10	6	1	400	2 14-c.m. 3-ton B.L.R., 2 10-c.m. do., 2 M.	..	1884	..	11·00	..	..
„	**Lionne**				500	141	9	23	11	„	9	6	1	426	1 14-c.m. B.L.R., 2 M., 2 l.	..	1877	..	9·81	..	..
„	**Lutin**				490	141	9	23	11	„	9	4	1	427	2 14-c.m. B.L.R., 2 l.	..	1877	..	10·00	..	..
„	**Lynx**				485	141	9	23	11	„	9	4	1	427	2 14-c.m. B.L.R., 2 l.	..	1878	..	10·38	..	..

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FRANCE.—Unarmoured Ships—*continued.*

cr., cruiser; *d.v.*, despatch vessel; *fr.c.*, frigate-built cruiser; *g.v.*, gun-vessel; *sl.*, sloop; *to.cr.*, torpedo cruiser; *to.g.b.*, torpedo gun-boat; P, deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at ten knots.
									Guns.	Dischargers or Torpedoes.					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
cr.	**Magon**	2300	249 4	38 0	wood & iron	18 0	1	2462	15 14-c.m. 3-ton B.L.R., 6 M., 2 l.	..	1881	..	14·17	..	..
g.v.	**Météore**	470	151 6	24 9	composite	10 6	1	450	2 14-c.m. B.L.R., 2 10-c.m. do., 2 M.	..	1884	..	10·00	..	..
sl.	**Milan**	1540	303 2	32 10	steel	14 7	2	4132	4 10-c.m. B.L.R., 8 M.	2 f. tu. or l.car	1884	..	18·00	..	..
fr.c.	**Minerve** (Requires repair)	2800	246 9	42 8	wood	21 4	1	1601	14 14-c.m. 3-ton B.L.R., 5 M.	..	1865	..	10·91	..	..
cr.	**Mogador** P. (Construction suspended)	4325	351 0	44 0	steel	20 0	2	8200	4 16-c.m. B.L.R., 6 14-c.m. do., 4 Q.F., 6 M.	f. tu. or l.car	Bldg.	..	19·00	..	..
fr.c.	**Naiade**	3500	246 0	47 2	wood & iron	22 10	1	3260	2 16-c.m. 5-ton B.L.R., 18 14-c.m. 3-ton do., 4 M., 1 l.	4 f. tu. or l.car	1881	..	13·68	..	..
cr.	**Nielly**	2300	262 5	37 5	„	18 8	1	2921	15 14-c.m. 3-ton B.L.R., 10 M.	..	1880	..	15·23	..	..
d.v.	**Papin**	825	199 6	28 6	wood	13 7	1	850	4 14-c.m. 3-ton B.L.R.	..	1886	37,000	13·00	..	..
d.v.	**Parseval**	790	197 6	28 0	„	12 2	1	817	4 14-c.m. 3-ton B.L.R.	..	1879	..	12·33	..	..
cr.	**Primauguet**	2400	262 5	37 5	wood & iron	18 8	1	2268	15 14-c.m. 3-ton B.L.R., 10 M.	..	1882	..	14·50	..	..
sl.	**Rigault de Genouilly**	1710	236 3	35 5	wood and iron topsides	17 0	1	2050	8 14-c.m. 3-ton B.L.R., 2 M.	..	1876	..	14·49	..	..
cr.	**Roland**	2300	249 4	38 0	„	17 7	1	2700	15 14-c.m. 3-ton B.L.R., 6 M.	..	1882	..	14·50	..	..
g.v.	**Sagittaire**	490	148 4	23 10	„	10 5	1	427	2 14-c.m. B.L.R., 2 10-c.m. do.	..	1881	..	11·05	..	..
to.g.b.	**Sainte Barbe**	320	196 10	21 7	steel	5 11	2	1800	3 3-inch Q.F., 3 M.	2 f. tu. or l.car	1885	..	18·00	..	..
„	**Salve**	320	196 10	21 7	„	5 11	2	1800	3 3-inch Q.F., 3 M.	2 f. tu. or l.car	1886	..	18·00	..	..

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cr.	Sané	1900	255	0	36	0	wood	18	4	1	1998	6 14-c.m. 3-ton B.L.R. . .	..	1870	..	15·02	..	..
g.v.	Scorpion	470	151	6	24	9	composite	10	6	1	450	2 14-c.m. 3-ton B.L.R., 2 10-c.m. do.	..	1883	..	11·00	..	..
sl.	Segond	1280	204	8	34	2	wood	15	10	1	894	6 14-c.m. 3-ton B.L.R., 2 M. . .	..	1869	..	11·26	..	..
cr.	Seignelay	1900	255	0	36	0	„	18	4	1	1967	8 14-c.m. 3-ton B.L.R. . . .	..	1874	..	15·00	..	..
fr.c.	Sfax . . . P.	4488	288	9	49	3	steel & wood	24	9	2	6034	6 16-c.m. 5-ton B.L.R., 10 14-c.m. 3-ton do., 3 Q.F., 5 M.	5 f. tu. or l.car	1884	200,000	16·84	800	..
g.v.	Sirius	473	142	0	24	9	wood	10	6	1	450	2 14-c.m. B.L.R., 2 10-c.m. do., 2 M.	..	Bldg.	..	..	..	..
cr.	Suchet . . . P.	3027	297	6	40	0	steel	17	6	2	9000	4 16-c.m. B.L.R., 4 Q.F., 6 M. .	4 f. tu. or l.car	Bldg.	..	20·00	480	4000 at 12½ kts.
„	Surcouf . . . P.	1850	312	0	30	5	„	14	0	2	6000	2 14-c.m. 3-ton B.L.R., 3 Q.F., 4 M..	5 f. tu. or l.car	1888	..	19·50	200	2400
fr.cr.	Tage . . . P.	7045	390	0	53	8	„	22	10	2	10,330	6 16-c.m. 5-ton B.L.R., 10 14-c.m. 3-ton do., 3 Q.F., 12 M.	7 f. tu. or l.car	1886	..	19·00	800	..
sl.	Talisman (Requires repair) .	1410	224	9	33	6	wood	15	5	1	691	4 14-c.m. 3-ton B.L.R., 2 10-c.m. do., 2 M.	..	1862	..	11·28	..	..
fr.c.	Tourville	5600	333	5	50	3	iron & wood	25	4	1	7466	7 16-c.m. 5-ton B.L.R., 14 14-c.m. 3-ton do., 1 l.	..	1876	..	16·89	800	..
	Troude . . . P.	1877	311	6	31	2	steel	14	0	2	6000	2 14 c.m. 3-ton B.L.R., 7 M. . .	5 f. tu. or l.car	1888	..	19·50	200	2400
sl.	Vaudreuil	1280	204	8	34	1	wood	15	10	1	867	6 14-c.m. 3-ton B.L.R., 2 M. . .	..	1870	..	11·00	..	..
to.cr.	Vautour	1280	216	6	29	3	steel	15	5	2	3200	5 10-c.m. B.L.R., 6 M. . . .	5 f. tu. or l.car	1886	80,000	17·50	..	..
fr.c.	Vénus	2800	246	9	42	8	wood	21	4	1	1308	16 14-c.m. B.L.R., 6 M. . .	..	1864	..	12·57	..	..
cr.	Villars	2400	249	4	38	0	wood & iron	17	7	1	2380	15 14-c.m. 3-ton B.L.R., 6 M. .	..	1879	..	14·25	..	..
g.v.	Vipère	490	145	4	23	10	composite	10	6	1	427	2 14-c.m. B.L.R., 2 10-c.m. do. .	..	1881	..	10·30	..	..
d.v.	Volage	510	160	5	28	3	wood	11	9	1	401	2 9-c.m. B.L.R., 4 M. . . .	..	1881	..	10·76	..	..
sl.	Volta (Requires repair) .	1350	207	8	33	9	„	15	7	1	1066	6 14-c.m. 3-ton B.L.R., 2 M. . .	..	1867	..	12·94	..	..
d.v.	Voltigeur	910	199	5	28	5	wood & iron	12	7	1	850	4 14-c.m. 3-ton B.L.R. . . .	..	1878	..	12·48	..	..
to.cr.	Wtatignies	1310	216	6	29	3	steel	15	6	2	3200	5 10-c.m. B.L.R., 1 6½-c.m. do., 6 M.	5 f. tu. or l.car.	Bldg.	..	17·50	..	..

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Besides transports, of which there is a large number, store ships, surveying vessels, training ships, yachts, sailing vessels, &c., there are, on the List of the French Navy, the following:—

River and local (screw) despatch vessels (Avisos de flotille).—Actif, Chimère, Corse, Cuvier, Élan, Ibis, Loyalty, Mouette. 240 to 410 tons; 205 to 417 I.H.P.

River and local (paddle) despatch vessels (Avisos de flotille).—Albatros, Alcyon, Alouette, Ardent, Basilic, Bengali, Brandon, Cigale, Cigogne, Écureuil, Goëland, Gogah, Héron, Jouffroy, Lézard, Magicien, Mesange, Oyap-ock, Pétrel, Pingouin, Pluvier, Salamandre, Vigilant.

River (screw) gunboats (Chaloupes canonnières).—Alerte, Arquebuse, Avalanche, Bäionette, Bouclier, Bourrasque, Carabine, Caronade Casse-tête Cimeterre, Épée, Escopette, Estoc, Flamberge, Framée, Glaive, Hache, Harpon, Javeline, Javelot, Massue, Mitrailleuse, Mousqueton, Mutine, Oluma (building for the Congo), Perrier, Rafale, Raynaud, Redoute, Revolver, Rollandes, Tirailleuse, Tromblon.

River (paddle) gunboats (Chaloupes canonnières). — Berthe-de-Villars, Biche, Bouillot, Bossant, Chamois, Cuvellier, Doucet, Éclair, Garnier, Henry-Rivière, Jacquin, Moulun, Pionnier, Trombe.

Torpedo boats, built and building:—

First Class.

Thirteen above 130 feet in length, from 65 to 148 tons displacement, from 20 to 24 knots speed, and armed with 2 to 4 launching tubes, and 2 to 4 machine guns.

Seventy of 100 to 130 feet in length, 43 to 54 tons displacement, 19 to 21 knots speed, and all armed with two bow tubes.*

Forty-one of 80 to 100 feet in length, 26 to 35 tons displacement, 17 to 20 knots speed. A few are armed with spar torpedoes, and the others with two bow tubes each. Total 124.

Second Class.

Seven of 60 to 80 feet long, one of 11 to 15 tons displacement, and 14 to 16 knots speed. Four are fitted with launching apparatus, two with side frames, and one with the spar torpedo.

* Of these fifty have been placed in reserve to await alterations before being passed as fit for sea service.

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GERMANY.—Armoured Ships.

a.g.b., armoured gunboat; *b.*, barbette ship; *br.*, broadside ship; *c.b.*, central-battery ship; *t.*, turret ship; *c.d.*, coast defence ship; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propellers.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt or Citadel.	Battery or Breastwork.					Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.	inches.	inches.	ins.	ft. in.						£	knots.	tons.	knots.
br. c.d.	**Arminius** . . (iron)	1583	197 4	36 0	4½	7½ turret	9	13 10	1	1200	4 21-c.m. 10-ton B.L.R. . . .	..	1864	92,512	10·50	200	..
b.	**Baden** . . . (iron)	7400	298 0	60 0	16	10 on barbette	8	19 8	2	5600	6 26-c.m. 18-ton Krupp B.L.R., 6 M., 4 l.	..	1880	444,886	14·00	700	..
a.g.b. c.d.	**Basilisk** . . (iron)	1109	143 0	35 6	8	8 turret	8	10 2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. . .	1 f. tu.	1878	58,042	9·00	40	..
b.	**Bayern** . . (iron)	7400	298 0	60 0	16	10 barbette	8	19 8	2	5600	6 26-c.m. 18-ton Krupp B.L.R., 6 M., 4 l.	..	1878	406,660	14·00	700	..
a.g.b. c.d.	**Biene** . . . (iron)	1109	143 0	35 6	8	8 turret	8	10 2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. . .	1 f. tu.	1876	62,853	9·00	40	..
„	**Camäleon** . . (iron)	1109	143 0	35 6	8	8 turret	8	10 2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. . .	1 f. tu.	1878	57,564	9·00	40	..
„	**Crocodil** . . (iron)	1109	143 0	35 6	8	8 turret	8	10 2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. . .	1 f. tu.	1879	57,237	9·00	40	..
c.b.	**Deutschland** . (iron)	7676	280 0	62 4	10	8	10	24 7	1	8000	8 26-c.m. 22-ton B.L.R., 1 21-c.m. 13-ton do., 2 15-c.m. 4-ton do., 6 M., 4 l.	5 f. tu. or l.car	1874	412,022	14·5	710	3400
„	**Friedrich Carl** . (iron)	6007	300 0	54 6	5	4½	15	23 11	1	3500	16 21-c.m. B.L.R., 6 M., 4 l. . .	..	1867	322,663	13·60	672	1550
t.	**Friedrich der Grosse** . (iron)	6770	307 0	53 6	9½	8 breastwork, 10 turret	8½	24 7	1	4930	4 26-c.m. 18-ton Krupp B.L.R, 2 17-c.m. 6-ton do., 6 M., 4 l.	..	1874	365,170	14·00	550	2500
c.b.	**Hansa** . . .(wood)	3610	235 2	45 0	6	6 to 4½	12½	21 8	1	2442	8 21-c.m. 9-ton B.L.R., 6 M., 4 l.	..	1872	183,270	12·00	300	..
a.g.b. c.d.	**Hummel** . . (iron)	1109	143 0	35 6	8	8 turret	8	10 2	1	700	1 30½-c.m. 35-ton B.L.R., 2 M. . .	1 f. tu.	1881	56,741	9·00	40	..
c.b.	**Kaiser** . . . (iron)	7676	280 0	62 4	10	8	10	24 7	1	7803	8 26-c.m. 23-ton B.L.R., 7 15-c.m. 4-ton do., 6 M., 4 l.	5 f. tu. or l.car	1874	411,301	14·60	710	3400
br.	**König Wilhelm** (iron)	9567	355 0	60 0	8	7	10	26 7	1	8350	18 24-c.m. 14½-ton B.L.R., 4 21-c.m 13-ton do., 6 15-c.m. 4-ton do., 6 M., 4 l.	..	1868	505,141	14·70	700	1740

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GERMANY.—Armoured Ships—*continued.*

a.g.b., armoured gunboat; *b.*, barbette-ship; *br.*, broadside-ship; *c.b.*, central battery ship; *t.*, turret-ship; *c.d.*, coast defence ship; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propellers.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt or Citadel.	Battery or Breastwork.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	ins.	ft. in.						£	knots.	tons.	knots.
c.b.	**Kronprinz** . .(iron)	5568	286 0	50 0	5	4½	16	24 3	1	4800	1 21-c.m. 12-ton B.L.R., 15 21-c.m. 9 ton do., 6 M., 4 l.	..	1867	314,836	14·30	650	..
a.g.b. c.d.	**Mücke** . . .(iron)	1109	143 0	35 6	8	8 turret	8	10 2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. . .	1 f. tu.	1877	60,960	9·00	40	..
„	**Natter** . . .(iron)	1109	143 0	35 6	8	8 turret	8	10 2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. . .	1 f. tu.	1880	52,822	9·00	40	..
b.	**Oldenburg** . (steel)	5200	246 0	59 0	13 (compound)	8 compound	..	19 6	2	3900	8 24-c.m. 18-ton Krupp B.L.R., 4 15-c.m. 4-ton do., 6 M., 4 l.	4 f. tu. or l.car	1884	235,342	13·5	250	..
t.	**Preussen** . .(iron)	6770	308 6	53 6	9	8 breast-work 10 turret	8	24 7	1	4383	4 26-c.m. 18-ton Krupp B.L.R., 2 17-c.m. do., 6 M., 4 l.	..	1873	351,904	14·00	550	2500
b.	**Sachsen** . .(iron)	7400	298 0	60 0	16	10 barbette	8	19 8	2	5600	6 26-c.m. 18-ton Krupp B.L.R., 6 M., 4 l.	..	1877	422,178	14·00	700	..
a.g.b. c.d.	**Salamander** . .(iron)	1109	143 0	35 6	8	8 turret	8	10 2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. . .	1 f. tu.	1880	56,914	9·00	40	..
„	**Scorpion** . .(iron)	1109	143 0	35 6	8	8 turret	8	10 2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. . .	1 f. tu.	1877	60,796	9·00	40	..
„	**Viper** . . .(iron)	1109	143 0	35 6	8	8 turret	8	10 2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. . .	1 f. tu.	1876	61,463	9·00	40	400 at 9 knots
„	**Wespe** . . .(iron)	1109	143 0	35 6	8	8 turret	8	10 2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. . .	1 f. tu.	1876	53,771	9·0	40	360 at 9 knots
b.	**Wurttemberg** .(iron)	7400	298 0	60 0	16	10 barbette	8	19 8	2	5600	6 26-c.m. 18-ton Krupp B.L.R., 6 M., 4 l.	..	1878	402,512	14·00	700	..
a.c.	Armour belted cruisers (five in number) .	3800	..	..	..	..	..	..	..	..	3 24-c.m. 19-ton B.L.R. . . .	..	Bldg.	..	..	..	..

corv., corvette; *d.v.*, despatch vessel; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; *to.r.*, torpedo ram; P, deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at ten knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	**Adler**	884	177 2	32 10	composite	11 6	1	724	2 15-c.m. 3½-ton B.L.R., 2 12-c.m. 27-cwt. do.	..	1883	44,047	11·00	..	..
„	**Albatross**	716	168 0	26 10	wood	10 6	1	496	2 15-c.m. 3½-ton B.L.R., 2 12-c.m. 27-cwt. do.	..	1871	38,092	10·00	..	..
corv.	**Alexandrine**	2373	236 3	42 7	iron, steel, and wood	18 4	1	2400	12 15-c.m. 4-ton B.L.R., 2 8·7 c.-m. 9-cwt. do., 4 M, 1 l.	1 f. tu. or l.car	1885	102,877	15·00	..	..
„	**Arcona**	2373	236 3	42 7	„	18 4	1	2400	12 15-c.m. 4-ton B.L.R., 2 8·7-c.m. 9-cwt. do., 4 M., 1 l.	1 f. tu. or l.car	1885	109,875	15·00	..	..
„	**Ariadne** (School ship)	1727	204 0	35 0	wood	17 4	1	2100	6 15-c.m. 3½-ton B.L.R., 2 12-c.m. 27-cwt. do., 4 M., 1 l.	..	1871	91,979	13·00	..	..
fr. cr.	**Bismarck**	2856	244 4	44 10	iron and wood	19 8	1	2529	16 15-c.m. 3½-ton B.L.R., 6 M., 2 l.	1 f. tu. or l.car	1877	136,055	13·00	..	..
d.v.	**Blitz**	1382	246 0	32 10	steel	13 5	2	2839	1 12½-c.m. 28-cwt. B.L.R., 4 8·7-c.m. 9-cwt. do., 4 M.	1 f. tu. or l.car	1882	66,935	16·00	..	..
fr.cr.	**Blucher***	2856	244 4	44 10	iron & wood	19 8	1	2990	16 15-c.m. B.L.R., 6 M. 2 l.	6 f. tu. or l.car	1877	136,408	14·00	..	..
to.r.	**Bremse** P.	866	203 5	27 10	steel	10 6	..	1500	1 21-c.m. 9-ton B.L.R.	..	1884	49,308	15·00	65	..
„	**Brummer** P.	866	203 5	27 10	steel	10 6	..	1500	1 21-c.m. 9-ton B.L.R.	..	1884	52,422	15·00	65	..
corv.	**Carola**	2169	226 4	42 7	iron and wood	18 4	1	2340	8 15-c.m. 3½-ton B.L.R., 2 8·7-c.m. 9-cwt. do., 4 M., 1 l.	..	1880	109,617	14·00	..	2000
fr.cr.	**Charlotte**	3360	244 6	45 0	iron & wood	18 6	1	3000	18 15-c.m. 4-ton B.L.R., 6 M., 2 l.	1 f. tu. or l.car	1885	..	16·00	..	..
g.v.	**Eber**	570	152 6	26 8	composite	10 4	..	..	3 12½-c.m. 27-cwt. B.L.R.	..	1887	..	12·00	..	..

* The Blucher is used as a torpedo school—Guns removed.

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GERMANY.—Unarmoured Ships—*continued.*

corv., corvette; *d.v.*, despatch vessel; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; *to.r.*, torpedo ram; P, deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft in.	ft. in.		ft. in.						£	knots.	tons.	knots.
fr.cr.	Elisabeth	2508	216 10	41 7	wood	19 1	1	2400	19 15-c.m. 4-ton B.L.R., 6 M., 2 l. .	..	1868	103,313	12·00	..	..
corv.	Freya	2017	259 2	35 0	„	17 4	1	2471	8 15-c.m. 3½-ton B.L.R., 4 M., 1 l. .	..	1874	106,868	15·0	..	..
corv.	Germania . . . P.	4300	339 6	46 0	steel	..	2	8000	14 15-c.m. B.L.R.	f. tu. or l.car	Bldg.	220,000 without arm't	18·0	900	..
fr.cr.	Gneisenau	2856	244 4	44 10	iron and wood	19 8	1	2500	16 15-c.m. 3½-ton B.L.R., 6 M., 2 l. .	tu.	1879	154,445	13·00	..	..
d.v.	Greif	2000	318 0	32 0	steel	13 0	2	5400	2 10½-c.m. 23-cwt. B.L.R., 10 M.. .	..	1886	..	19·00	..	..
„	Grille	350	170 6	24 3	wood	10 0	1	650	1 12½-c.m. 28-cwt. B.L.R., 2 8-c.m. do.	..	1857	..	13·00	..	..
g v.	Habicht	848	174 0	29 6	composite	11 5	1	875	1 15-c.m. 3½-ton B.L.R., 4 12-c.m. 27-cwt. do., 4 8·7-c.m. do.	..	1879	33,054	12·00	..	..
„	Hyäne.	489	139 8	25 1	iron	9 10	1	340	2 10½-c.m. B.L.R., 2 l. . . .	..	1878	24,340	9·00	..	..
„	Iltis	489	139 8	25 1	„	9 10	1	380	2 10½-c.m. B.L.R., 2 l. . . .	..	1878	27,480	9·00	..	..
corv.	Irene . . . . P.	4300	339 6	46 0	steel	21 0	2	8000	14 15-c.m. B.L.R.	1 f. tu. l. car.	1887	220,000 without arm't	18·0	900	..
d.v.	Jagd	1240	275 6	31 6	steel	13 9	2	4000	3 10½-c.m. 23-cwt. B.L.R., 10 M.. .	..	1888	..	19·0	..	..
fr.cr.	Leipzig	3925	282 2	45 8	iron and wood	21 7	1	3590	2 17-c.m. 5½-ton B.L.R., 10 17-c.m. 3½-ton. 6 M., 2 l.	..	1875	203,055	14·00	..	4000
corv.	Luise (School ship) . .	1719	204 0	35 0	wood	17 4	1	2100	6 15-c.m. 3½-ton B.L.R., 2 12-c.m. 27-cwt. do., 4 M., 1 l.	..	1872	85,975	13·00	..	..
„	Marie	2169	226 4	42 7	iron & wood	18 4	1	2257	8 15-c.m. 3½-ton B.L.R., 2 8·7-c.m. 9-cwt. do., 4 M., 1 l.	1 f. tu. or l.car	1881	..	13·50	..	2000
fr.cr.	Moltke	2856	244 4	44 10	„	19 8	1	2500	16 15-c.m. 3½-ton B.L.R., 6 M., 2 l. .	1 f. tu. or l.car	1877	140,705	13·50	..	..
g.v.	Möwe	848	174 0	29 6	composite	11 5	1	784	1 15-c.m. 3½-ton B.L.R., 4 12-c.m. 27-cwt. do., 4 8·7-c.m. 9-cwt. do	..	1879	33,390	12·00	..	..

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corv.	**Olga**		2169	226	4	42	7	iron & wood (sheathed)	18	4	1	2397	8 15-c.m. 3½-ton B.L.R., 2 8·7-c.m. 9-cwt. do., 4 M., 1 l.	..	1880	113,812	14·00	..	2000
d.v.	**Pfeil**		1382	246	0	32	10	steel	13	5	2	2700	1 12½-c.m. 28-cwt. B.L.R., 4 8·7-c.m. 9-cwt. do., 4 M.	1 f. tu.	1882	73,605	15·00	..	..
corv.	**Prinzess Wilhelm**	P.	4300	339	6	46	0	„	..		2	8000	14 15-c.m. B.L.R.	1 f. tu. 11 l. car.	1887	220,000 without arm't	18·0	900	..
fr.cr.	**Prinz Adalbert**		3925	282	2	45	8	iron & wood	21	7	1	3612	2 17-c.m. 5½-ton B.L.R., 10 17-c.m. 3½-ton do., 6 M., 2 l.	..	1876	206,499	15.00	..	..
g.v.	**Schwalbe**		1300	203	0	30	6	composite	12	4	2	1500	8 10½-c.m. 22½-cwt. B.L.R. Krupp, 4 M.	..	1887	..	13·50	..	..
corv.	**Sophie**		2169	226	4	42	7	iron & wood	18	4	1	2100	8 15-c.m. 3½-ton B.L.R., 2 8·7-c.m. 9 cwt. do., 4 M., 1 l.	..	1881	117,155	14·00	..	2000
g.v.	**Sperber**		1300	236	0	29	8	composite	12	6	2	1500	8 10½-c.m. 22½-cwt. B.L.R., 4 M.	..	1888	..	13·5	..	..
fr.cr.	**Stein**		2856	244	4	44	10	„	19	8	1	2707	16 15-c.m. 3½-ton B.L.R., 6 M., 2 l.	1 f. tu. or l.car	1879	136,069	14·00	..	..
„	**Stosch**		2856	244	4	44	10	„	19	8	1	2581	16 15-c.m. 3½-ton B.L.R., 6 M., 2 l.	1 f. tu. or l.car	1877	126,066	13·00	..	..
corv.	**Victoria**		1825	235	9	35	4	wood	17	8	1	1300	4 15-c.m. 3½-ton B.L.R., 6 12-c.m. 27-cwt. do., 4 M., 1 l.	..	1864	84,450	13·00	..	..
d.v.	**Wacht**		1240	275	6	31	6	steel	13	9	2	4000	3 10½-c.m. 23-cwt. B.L.R., 10 M.	..	1887	..	20·0	..	..
g.v.	**Wolf**		489	139	8	25	1	iron	9	10	1	340	2 10½-c.m. 23-cwt. B.L.R., 2 l.	..	1878	24,343	9·00	..	..
d.v.	**Zieten**		975	196	10	29	6	„	11	6	1	2323	4 12-c.m. 27-cwt. B.L.R., 4 M.	..	1876	81,755	16·00	140	..
	2 Torpedo Gunboats (not named)		220	186	0	21	5	steel	..		2	2000	.. ..	..	Bldg.	..	19·00	..	..

For Programme of unarmoured ships to be built, see Chap. V. of Part I., page 74.

There are, also, on the German list, besides stationary, surveying, harbour vessels and yachts, the following:—

One steam gunnery ship.—Mars of 3333 tons displacement, and 2000 I.HP.

Two steam gunnery tenders.

One steam torpedo tender (Ulan).

One steam gunboat (Dracke).

One steam training ship—Nixe.

Eight small torpedo vessels; 50 to 140 tons, 500 to 550 I.HP.

Torpedo Boats.

First-class, built and building, 7 above 130 feet long, of 220 tons displacement, and from 20 to 23 knots speed, with 2 to 3 launching tubes, and 6 machine guns; 85 of 100 to 130 feet in length, of 50 to 140 tons displacement, and from 14 to 22 knots speed, all with 2 launching tubes and 2 machine guns.

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GREECE.—Armoured Ships.

br., broadside ship; *c.b.*, central-battery ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour. Belt.	Armour. Battery.	Backing.	Mean Draught of Water.	Propeller.	Indicated Horse power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.	inches.	inches.	ins.	ft. in.						£	knots.	tons.	
	Hydra . (steel)	4885	334 0	51 10	14	14 & 12	..	18 0	2	6700	3 27-c.m. B L.R., 5 15-c m do. . .	5 f. tu. or l. car	1889	..	17·00	..	..
	New ship . .	..	..	..	..	..	..	..	2	..	3 27-c.m, B.L.R., 5 15-c.m. do.	..	Bldg.	..	..	..	..
c.b.	**King George** (iron)	1774	200 2	32 10	7	6	..	15 6	2	2400	2 21-c.m. 10-ton B.L.R. (Krupp), 2 M., 4 l. .	..	1867	..	12·00	210	..
br.	**Olga** . (wood)	2060	230 0	59 0	4½	4	..	18 0	1	1950	4 17-c.m. 5½-ton B.L.R. (long Krupp), 2 17-c.m. 3½-ton do. (short), 2 M., 4 l.	..	1869	..	10·00	240	..

Two other ships precisely similar to the Hydra are building at Havre by the Forges et Chantiers Co.

GREECE.—Unarmoured Ships.

cr., cruiser; *corv.*, corvette; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	
g.v.	**Acheloos** . . .	420	138 0	24 11	steel	11 6	1	400	2 9·6-c.m. B.L.R. (Krupp), 3 M. . .	..	1884	..	10·00	50	..
corv.	**Admiral Miaulis** .	1800	246 0	36 0	iron and wood	14 5	1	2200	3 17-c.m. B.L.R. 5½-ton (long Krupp), 1 17-c.m. 3½-ton do. (short), 2 M., 4 l.	..	1879	..	15·00	220	..
g.v.	**Alpheos**	420	138 0	24 11	steel	11 6	1	400	2 9·6-c.m. B.L.R. (Krupp), 3 M. . .	..	1884	..	10·00	50	..
„	**Aphroessa** . .	380	124 7	22 11	iron	9 10	1	160	1 8·7-c.m. B.L.R. (Krupp) . . .	..	1858	..	9·00	30	..
„	**Eurotas** . . .	420	138 0	24 11	steel	11 6	1	400	2 9·6-c.m. B.L.R. (Krupp), 3 M. . .	..	1884	..	10·00	50	..
fr.cr.	**Hellas** . . .	1300	200 2	37 0	wood	19 4	1	1500	12 15-c.m. B.L.R. (Krupp), 2 M. . .	..	1878 (repaired)	..	11·00	230	..
g.v.	**Hydra**	440	124 8	29 6	steel & wood	9 6	2	380	1 26-c.m. 26-ton B.L.R. (Krupp), 2 M. .	..	1881	..	10.00	60	..
cr.	**Mecali** (was Buzzard) .	1000	210 6	32 6	steel	..	2	1000	.. ..	..	1880	..	..	..	..
g.v.	**Nauplion** . . .	380	124 7	22 11	iron	9 10	1	160	1 8·7-c.m. B.L.R. (Krupp) . . .	..	1858	..	9·00	30	..

„	Peneus	420	138	0	24	11	steel	12	6	1	400	2 9·6-c.m. B.L.R. (Krupp), 3 M. . .	..	1884	..	10·55	50	..
„	Plixiavra . . .	380	124	7	22	11	iron	9	10	1	160	1 8·7-c.m. B.L.R. (Krupp)	..	1856	..	9·00	55	..
cr.	Salamina . . .	380	123	0	23	11	„	9	10	1	200	1 8·7-c.m. B.L.R. (Krupp), 1 M. . .	..	1858	..	8·00	60	..
„	Sfaktirea (was Eldorado)	1000	235	0	30	0	steel	13	0	1	1700	.. ..	..	1885	..	14·50	100	..
g.v.	Spezia	440	124	8	29	6	steel & wood	9	6	2	680	1 26-c.m. 26-ton B.L.R. (Krupp), 2 M. .	..	1881	..	11·30	50	..
„	Syros	380	124	7	22	11	iron	9	10	1	160	1 8·7-c.m. B.L.R. (Krupp) . . .	..	..	..	9·00	18	..

Torpedo depôt ship.—Psara, 1100 tons, 500 IH.P., 2 10-c.m. B.L.R. (Krupp) guns, 2 Whitehead torpedo-launching guns, one port on each broadside, 2 under-water torpedo tubes ahead. 14 knots speed.

Torpedo boats.—32 of several classes, 6 being sea-going, of 128 ft. long, 15 ft. 3 in. broad, of 85 tons displacement, 1000 horse-power, and 19 knots speed, built at Stettin; and 6 other first class boats, built by Yarrow, of about 100 ft. in length, of 46 tons displacement, and 620 horse-power and 20 knots speed. Twenty smaller steam-boats for torpedo purposes.

There are also four small iron steamers fitted for spar torpedoes; and five small composite custom-house steamers, also a paddle yacht and a screw transport—the Bosbulina—of 1170 tons displacement, and 1800 horse-power.

HAYTI.

(The Republic of Hayti has unarmoured ships only.) *corv.*, corvette; *g.v.*, gun-vessel; *sl.*, sloop.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean draught of water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	22nd December .	900	208 0	29 11	iron	16 0	1	360	4 40-pdr. (Armstrong)	..	1860	..	9·00	..	..
corv.	Dessalines . .	..	185 0	32 0	„	14 9	1	190 (nominal)	1 7-in., 2 30-pdr., 4 24-pdr. . . .	..	1883	..	16·00	..	..
sl.	St. Michael . .	850	162 0	33 0	„	11 0	1	120 (nominal)	1 11-in. smoothbore, 8 30-pdr. . .	..	1875	..	12·00	..	..
„	1804 . . .	600	145 0	29 0	„	10 0	1	100 (nominal)	1 10-in. smoothbore, 6 30-pdr. . .	..	1875	..	12·00	..	..
„	Toussaint L'ouverture	500	164 0	24 6	steel	9 6	1	800	1 6¼-in. B.L.R., 2 4¾-in. do., 2 M.	..	1886	..	12·00	120	3000

NOTE ON HAYTIAN SHIPS.

The Toussaint L'ouverture was built at La Seyne, near Toulon, during the year 1886.

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GREECE.—Armoured Ships.

br., broadside ship; *c.b.*, central-battery ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour. Belt.	Armour. Battery.	Backing.	Mean Draught of Water.	Propeller.	Indicated Horse power.	Armament. Guns.	Armament. Fish Torpedo Dis-chargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.	inches.	inches.	ins.	ft. in.						£	knots.	tons.	
	Hydra . (steel)	4885	334 0	51 10	14	14 & 12	..	18 0	2	6700	3 27-c.m. B.L.R., 5 15-c.m. do. . .	5 f. tu. or l. car	1889	..	17·00	..	..
	New ship . .	..	..	..	..	..	..	..	2	..	3 27-c.m, B.L.R., 5 15-c.m. do. . . .	..	Bldg.	..	..	..	..
c.b.	**King George** (iron)	1774	200 2	32 10	7	6	..	15 6	2	2400	2 21-c.m. 10-ton B.L.R. (Krupp), 2 M., 4 l. .	..	1867	..	12·00	210	..
br.	**Olga** . (wood)	2060	230 0	59 0	4¾	4	..	18 0	1	1950	4 17-c.m. 5½-ton B.L.R. (long Krupp), 2 17-c.m. 3½-ton do. (short), 2 M., 4 l.	..	1869	..	10·00	240	..

Two other ships precisely similar to the Hydra are building at Havre by the Forges et Chantiers Co.

GREECE.—Unarmoured Ships.

cr., cruiser; *corv.*, corvette; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dis-chargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	
g.v.	**Acheloos** . . .	420	138 0	24 11	steel	11 6	1	400	2 9·6-c.m. B.L.R. (Krupp), 3 M. . .	..	1884	..	10·00	50	..
corv.	**Admiral Miaulis** .	1800	246 0	36 0	iron and wood	14 5	1	2200	3 17-c.m. B.L.R. 5½-ton (long Krupp), 1 17-c.m. 3½-ton do. (short), 2 M., 4 l.	..	1879	..	15·00	220	..
g.v.	**Alpheos** . . .	420	138 0	24 11	steel	11 6	1	400	2 9·6-c.m. B.L.R. (Krupp), 3 M. . .	..	1884	..	10·00	50	..
„	**Aphroessa** . .	380	124 7	22 11	iron	9 10	1	160	1 8·7-c.m. B.L.R. (Krupp) . . .	..	1858	..	9·00	30	..
„	**Eurotas** . . .	420	138 0	24 11	steel	11 6	1	400	2 9·6-c.m. B.L.R. (Krupp), 3 M. . .	..	1884	..	10·00	50	..
fr.cr.	**Hellas** . . .	1300	200 2	37 0	wood	19 4	1	1500	12 15-c.m. B.L.R. (Krupp), 2 M. . .	..	1878 (repaired)	..	11·00	230	..
g.v.	**Hydra**	440	124 8	29 6	steel & wood	9 6	2	380	1 26-c.m. 26-ton B.L.R. (Krupp), 2 M. .	..	1881	..	10.00	60	..
cr.	**Mecali** (was Buzzard) .	1000	210 6	32 6	steel	..	2	1000	.. ..	..	1880	..	..	..	..
g.v.	**Nauplion** . . .	380	124 7	22 11	iron	9 10	1	160	1 8·7-c.m. B.L.R. (Krupp) . . .	..	1858	..	9·00	30	..
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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„	Peneus	420	188	0	24	11	steel	12	6	1	400	2 9·6-c.m. B.L.R. (Krupp), 3 M.	..	1884	..	10·55	50	..
„	Plixiavra	380	124	7	22	11	iron	9	10	1	160	1 8·7-c.m. B.L.R. (Krupp)	..	1856	..	9·00	55	..
cr.	Salamina	380	123	0	23	11	„	9	10	1	200	1 8·7-c.m. B.L.R. (Krupp), 1 M.	..	1858	..	8·00	60	..
„	Sfaktirea (was Eldorado)	1000	235	0	30	0	steel	13	0	1	1700	.. ..	..	1885	..	14·50	100	..
g.v.	Spezia	440	124	8	29	6	steel & wood	9	6	2	680	1 26-c.m. 26-ton B.L.R. (Krupp), 2 M.	..	1881	..	11·30	50	..
„	Syros	380	124	7	22	11	iron	9	10	1	160	1 8·7-c.m. B.L.R. (Krupp)	..	..	..	9·00	18	..

Torpedo depôt ship.—Psara, 1100 tons, 500 IH.P., 2 10-c.m. B.L.R. (Krupp) guns, 2 Whitehead torpedo-launching guns, one port on each broadside, 2 under-water torpedo tubes ahead. 14 knots speed.

Torpedo boats.—32 of several classes, 6 being sea-going, of 128 ft. long, 15 ft. 3 in. broad, of 85 tons displacement, 1000 horse-power, and 19 knots speed, built at Stettin; and 6 other first class boats, built by Yarrow, of about 100 ft. in length, of 46 tons displacement, and 620 horse-power and 20 knots speed. Twenty smaller steam-boats for torpedo purposes.

There are also four small iron steamers fitted for spar torpedoes; and five small composite custom-house steamers, also a paddle yacht and a screw transport—the Bosbulina—of 1170 tons displacement, and 1800 horse-power.

HAYTI.

(The Republic of Hayti has unarmoured ships only.) *corv.*, corvette; *g.v.*, gun-vessel; *sl.*, sloop.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean draught of water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	22nd December	900	208 0	29 11	iron	16 0	1	360	4 40-pdr. (Armstrong)	..	1860	..	9·00	..	..
corv.	Dessalines	..	185 0	32 0	„	14 9	1	190 (nominal)	1 7-in., 2 30-pdr., 4 24-pdr.	..	1883	..	16·00	..	..
sl.	St. Michael	850	162 0	33 0	„	11 0	1	120 (nominal)	1 11-in. smoothbore, 8 30-pdr.	..	1875	..	12·00	..	..
„	1804	600	145 0	29 0	„	10 0	1	100 (nominal)	1 10-in. smoothbore, 6 30-pdr.	..	1875	..	12·00	..	..
„	Toussaint L'ouverture	500	164 0	24 6	steel	9 6	1	800	1 6½-in. B.L.R., 2 4¾-in. do., 2 M.	..	1886	..	12·00	120	3000

NOTE ON HAYTIAN SHIPS.

The Toussaint L'ouverture was built at La Seyne, near Toulon, during the year 1886.

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ITALY.—Armoured Ships.

a.g.b., armoured gunboat; *b.*, barbette ship; *c.b.*, central-battery ship; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Citadel or Turret.					Guns.	White-head Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.	inches.	inches.	ins	ft. in.						£	knots.	tons.	knots.
t.	**Affondatore** . .(iron)	4376	290 0	40 0	5	5 turret	9	20 0	1	3240	2 25-c.m. 28-ton B.L.R. (Armstrong), 4 12-c.m. do., 6 M.	4 l. car.	1865	152,480	12·00	460	1647
c.b.	**Ancona** . . .(iron)	4250	256 0	50 0	4½	4½	13¾	25 0	1	2548	6 15-c.m. B.L.R., 6 12-c.m. do. 6 M. .	2 l. car.	1864	172,000	11·2	485	2000
b.	**Andrea Doria** (steel)	11,000	328 2	65 4	18 comp.	18 comp.	..	27 2	2	10,000	4 43-c.m. 105-ton B.L.R. (Armstrong), 2 15-c.m. do., 4 12-c.m. do., 12 M.	5 f. tu. or l. car (2 sub)	1885	..	16·00	850	4500
c.b.	**Castelfidardo** . .(iron)	4250	256 0	50 0	4½	4½	13¾	21 11	1	2125	8 15-c.m. B.L.R., 6 12-c.m. do., 6 M. .	2 l. car.	1863	..	12·00	485	2600
t.	**Dandolo** . (iron and steel)	11,202	340 11	64 9	21½	18 turret	22¾	26 7	2	7500	4 45-c.m. 100-ton M.L.R. (Armstrong), 3 12-c.m. B.L.R., 12 M.	1 f. tu. 2 l. car.	1878	700,000	15·60	1000	3760
„	**Duilio** . (iron and steel)	11,138	340 11	64 9	21½	18 turret	22¾	26 7	2	7500	4 45-c.m. 100-ton M.L.R. (Armstrong), 3 12-c.m. Q.F., 12 M.	1 f. tu. 2 l. car.	1876	..	15·00	1000	3760
c.b.	**Formidabile** . .(iron)	2725	216 0	45 10	4½	4½ battery	9	18 0	1	1100	4 20-c.m. 7-ton M.L.R. (Armstrong), 2 15-c.m. B.L.R., 5 12-c.m. do., 4 M.	..	1861	118,000	11·00	310	..
b.	**Francesco Morosini** (steel)	11,000	328 2	65 4	18 comp.	18 comp.	..	27 2	2	10,000	4 43-c.m. 105-ton B.L.R. (Armstrong), 2 15-c.m. do., 4 12-c.m. do., 14 M.	5 f. tu. or l. car (2 sub)	1885	..	16·00	850	4500
„	**Italia** . . (steel)	13,851	400 6	74 0	16-inch funnel op'nings	19 comp.	22¾	31 2	2	18,000	4 43-c.m. 100-ton B.L.R. (Armstrong), 8 15-c.m. 4-ton do., 14 M.	4 f. tu. or l. car	1880	..	18·00	1650	8900

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„	Lepanto .	(steel)	13,550	400	6	74	0	16-inch funnel op'nings	19 comp.	22¾	31	2	2	18,000	4 43-c.m. 100-ton B.L.R. (Armstrong), 8 15-c.m. 4-ton do., 14 M., 4 l.	4 f. tu. or l. car	1883	..	18·38	1650	900
c.b.	Maria Pia .	.(iron)	4268	256	0	49	4	4½	4½	13¾	22	7	1	2924	8 15-c.m. B.L.R., 6 12-c.m. do., 6 M. .	2 l. car.	1863	..	12·00	485	2600
2 batteries	Palestro . .	(wood)	6419	265	0	57	10	8¾	6	24	26	11	1	3496	1 28-c.m. 25-ton M.L.R. (Armstrong), 6 25-c.m. 18-ton do., 6 M., 6 l.	2 l. car.	1873	..	13·00	513	1780
„	Principe Amedeo	(wood)	5814	265	0	57	9	8¾	6	24	26	6	1	3413	1 28-c.m. 25-ton M.L.R. (Armstrong), 6 25-c.m. 18-ton do., 6 M., 6 l.	2 l. car.	1872	..	13·00	513	1780
b.	Re Umberto	(steel)	13,251	400	0	76	9	..	18 barbettes	..	28	6	2	19,500	4 34-c.m. 67-ton B.L.R. (Armstrong), 8 15-c.m. do., 16 12-c.m. do., 10 Q.F. and M.	7 f. tu. or l. car	1888	..	18·00	1200	..
c.b.	Roma . .	(wood)	5814	262	6	58	6	4½	4½ battery	26	25	3	1	3000	9 22-c.m. 13-ton M.L.R., (Armstrong), 6 M., 6 l.	2 l. car.	1865	..	13·00	511	1940
b.	Ruggiero di Lauria . (steel)		11,000	328	2	65	4	18 comp.	18 comp. barbettes	..	27	2	2	10,000	4 43-c.m. 105-ton B.L.R. (Armstrong), 2 15-c.m. do., 4 12 c.m. do., 12 M.	5 f. tu. or l. car (2 sub)	1884	..	17·5	850	4500
c.b.	San Martino .	. (iron)	4268	256	0	49	4	4½	4½	14	22	7	1	2620	8 15-c.m. B.L.R., 6 12-c.m. do., 6 M. .	2 l. car.	1863	..	12·00	490	..
b.	Sardegna .	(steel)	13,251	400	0	76	9	..	18 comp. barbettes	..	28	6	2	22,800	4 34-c.m. 67-ton B.L.R. (Armstrong), 8 15-c.m. do., 6 12-c.m. do., 10 Q.F. and M.	7 f. tu. or l. car	Bldg.	..	19·00	1200	..
„	Sicilia . .	(steel)	13,251	400	0	76	9	..	18 comp. barbettes	..	28	6	2	19,500	4 34-c.m. 67-ton B.L.R. (Armstrong), 8 15-c.m. do., 16 12-c.m. do., 10 Q F. and M.	7 f. tu. or l car	Bldg.	..	18·00	1200	..
c.b.	Terribile . .	(iron)	2725	210	0	45	11	4½	4½ battery	9	18	0	1	1100	8 20-c.m. 7-ton M.L.R. (Armstrong), 4 m., 6 l.	4 l. car.	1861	112,454	11·00	310	..
„	Varese . .	(iron)	2220	200	0	42	7	4½	4½ battery	9	15	9	2	977	4 20-c.m. 7-ton M.L.R. (Armstrong), 1 16-c.m. M.L.R., 4 M., 6 l.	..	1865	85,000	10·00	180	..

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ITALY.—Unarmoured Ships.

corv., corvette; *d.v.*, despatch vessel; *g.v.*, gun-vessel; *fr.cr.*, frigate-built cruiser; *to.g.b.*, torpedo gun boat; *to.cr.*, torpedo cruiser; *to.r.cr.*, torpedo-ram cruiser; *to.s.*, torpedo ship; P, deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armaments.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
d.v.	Agostino Barbarigo	656	216 6	23 11	steel	10 10	1	1700	5 57-c.m. Nordenfelt Q.F.	..	1879	..	15·00	210	1000
corv.	Amerigo Vespucci . P.	2533	255 11	42 7	„	17 0	1	5000	8 15-c.m. 4-ton B.L.R., 6 M., 3 l.	2 l. car.	1882	..	15·00	500	..
g.v.	Andrea Provana	649	167 4	26 3	„	10 2	1	1000	4 5-inch B.L.R., 2 M.	..	1884	..	13·00	120	..
d.v.	Archimede	770	230 0	26 3	„	10 0	1	1700	4 12-c.m. B.L.R., 4 M.	2 l. car	1887	..	16·00	210	..
to.cr.	Aretusa	740	230 0	25 6	„	11 9	3	4200	4 6-pdr. and 4 3-pdr. Q.F., 3 M.	5 f. tu. or l.car	Bldg.	..	20	180	..
corv.	Caracciolo (Training ship)	1650	209 11	36 0	wood	16 5	1	973	6 16-c.m. 5-ton M.L.R., 4 M., 1 l.	..	1869	..	10·00	180	..
g.v.	Cariddi	1050	177 2	28 6	„	12 5	1	956	1 16-c.m., 2 12-c.m. B.L.R., 4 M., 2 l.	..	1875	..	10·00	164	..
to.cr.	Confienza	740	230 0	25 6	steel	9 0	3	3600	1 4-inch B.L.R., 4 6-pdr., and 2 3-pr. Q.F.G., 3 M.	5 f. tu. or l.car	1887	..	20·00	180	..
corv.	Cristoforo Colombo	2362	249 4	36 0	wood	17 4	1	3782	8 12-c.m. B.L.R., 4 M., 2 l.	..	1875	..	15·00	471	3600
d.v.	Curtatone	1040	177 3	32 8	steel	13 6	1	1100	6 5-inch B.L.R.	..	1887	..	12·00	197	..
cr.	Dogali . . . P.	2020	250 0	37 0	„	14 6	2	7600	6 6-inch B.L.R. (Armstrong), 9 6-pr. Q.F., 6 M.	6 l. car	1887	170,000	19·66	480	..
„	Four cruisers Dogali type P.	..	..	..	..	..	..	..	..	approved to be built		..	..	..	..
to.r.cr.	Etna . . . P.	3530	282 2	42 7	„	19 0	2	6000	2 25-c.m. 28-ton B.L.R. (Armstrong), 6 15-c.m. 4-ton do., 6 Q.F., 2 M., 2 l.	4 f. tu. or l.car	1885	64,000 (engines)	17·00	630	..
c.r.	Etruria . . . P.	2245	262 6	39 6	„	16 6	2	6500	6 15-c.m. B.L.R., 4 12-c.m. do.	..	Bldg.	..	18·50	400	..
d.v.	Faadi Bruno	840	137 6	32 9	„	..	1	800	..	..	Bldg.	..	12·0	..	..
cr.	Fieramosca . . P.	3745	290 0	43 6	„	19 4	2	7700	2 25-c.m. 25-ton B.L.R., 6 6-inch 4-ton B.L.R.	4 f. tu. or l.car	1888	..	17·00	590	..
corv.	Flavio Gioja . . P.	2533	255 11	42 7	„	17 0	1	5000	8 15-c.m. 4-ton B.L.R. (Armstrong), 6 M., 3 l.	2 l. car.	1881	..	15·00	500	..
to.g.b.	Folgore	317	187 0	19 8	„	6 7	2	2400	2 6-pr. and 2 3-pr. Q.F.G., 3 M.	3 f. tu. or l. car	1886	..	20·00	90	..

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d.v.	**Galileo**		770	230	0	26	3	„	8	2	1	1700	4 5-inch B.L.R.,							
fr.cr.	**Garibaldi** (*Hospital ship*)		3376	223	2	49	3	wood	20	11	1	1041	8 16-c.m. M.L.R., 4 M., 4 l.	..	1860	..	9·00	330	..
cr.	**Giovanni Bausan**	P.	3068	275	7	42	7	steel	18	4	2	6500	2 25-c.m. 24-ton B.L.R. (Armstrong), 6 15-c.m. 5-ton B.L.R., 4 M., 2 l.	3 f. tu. or l.car (1 f. tu. sub)	1883	160,000	17·00	600	5000
to.cr.	**Goito**		740	230	0	25	6	„	11	9	2	4200	4 6-pr. and 2 3-pr. Q.F.G., 3 M.	6 f. tu. or l.car	1887	..	20·00	180	..
cr.	**Liguria**	P.	2245	262	6	39	6	„	16	6	2	6500	6 15-c.m. B.L.R., 4 12-c.m. do.	..	Bldg.	..	18·50	400	..
cr.	**Lombardia**	P.	2245	262	6	39	6	„	16	6	2	6500	6 15-c.m. B.L.R., 4 12-c.m. do.	..	Bldg.	..	18·50	400	..
d.v.	**Marcantonio Colonna**		656	216	6	23	11	„	10	10	1	1700	5 57 m m. Q.F., 2 M.	..	1879	..	15·40	197	..
cr.	**Marco Polo**	P.	3700	290	0	45	9	„	19	4	2	10,000	8 15-c.m. B.L.R., 6 12-c.m. do.	..	Bldg.	..	..	..	..
to.cr.	**Minerva**		740	230	0	25	6	„	11	9	3	4200	6 6-pr. and 2 3-pr. Q.F., 3 M.	5 f. tu. or l.car	Bldg.	..	20·00	180	..
„	**Montebello**		740	230	0	25	6	„	11	9	3	4200	6 6-pr. Q.F.G., 2 3-pr. do., 3 M.	5 f. tu. or l.car	1888	..	20·00	180	..
„	**Monzambano**		740	230	0	25	6	„	11	9	3	4200	6 6-pr. and 2 3-pr. Q.F.G., 3 M.	5 f. tu. or l.car	1888	..	20·00	180	..
„	**Partenope**		740	230	0	25	6	„	11	9	3	4200	6 6-pr. and 2 3-pr. Q.F., 3 M.	5 f. tu. or l.car	Bldg.	..	20·00	180	..
cr.	**Piemonte**	P.	2500	300	0	38	0	„	15	0	2	12,000	6 6-inch Q.F., 6 4¾-inch do., 10 6-pdr. do., 10 M. (4 being maxims)	3 f. tu.	1888	..	21·00	600	13,000
to.s.	**Pietro Micca**		535	203	5	19	7	iron	10	6	1	972	2 M.	..	1876	..	10·00	28	..
d.v.	**Rapido**		1568	262	5	30	6	„	12	6	1	1920	5 57-m.m. Q.F., 2 M.	2 f. tu. or l.car	1876	..	13·40	300	2560
to.g b.	**Saetta**		317	187	0	19	8	steel	6	7	1	2400	2 6-pr. Q.F.G., 2 3-pr. do., 3 M.	..	1887	..	20·00	90	..
corv.	**Savoia** (used as a Royal Yacht)	P.	2850	275	6	42	7	„	17	0	1	5000	6 6-pr. Q.F., 6 M.	..	1883	..	15·00	500	..
g.v.	**Scilla**		1050	177	2	28	6	wood	12	5	1	826	2 12-c.m. B.L.R. (Armstrong), 1 16-c.m., 4 M.	..	1874	..	10·00	..	..
„	**Sebastiano Veniero**		649	167	4	26	3	steel	10	2	1	1000	4 12-c.m. B.L.R., 2 M.	..	1884	..	13·00	..	..
d.v.	**Stafetta**		1505	252	7	30	10	iron	13	2	1	1800	4 12-c.m. B.L.R., 6 M.	1 f. tu. (sub.)	1876	..	13·50	300	3300
to.r.cr.	**Stromboli**	P.	3530	282	2	42	7	steel	19	0	2	7700	2 25-c.m. 28-ton B.L.R. (Armstrong), 6 15-c.m. 4-ton do., 8 M.	4 f. tu. or l.car	1886	64,000 (Engines)	17·00	630	..
to.cr.	**Tripoli**		740	230	0	25	6	„	11	9	2	4200	4 6-pr. and 2 3-pr. Q.F.R., 3 M.	5 f. tu. or l.car	1886	..	*20·00	180	..

(*) It is stated that the Tripoli attained a speed of 21 knots on an actual trial.

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ITALY.—Unarmoured Ships.—*continued.*

corv., corvette; *d.v.*, despatch vessel; *g.v.*, gun-vessel; *fr.cr.*, frigate-built cruiser; *to.g.b.*, torpedo gunboat; *to.cr.*, torpedo cruiser; *to.r.cr.*, torpedo-ram cruiser; *to.s.*, torpedo ship; P., deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armaments. Guns.	Armaments. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
to.cr.	(Two unnamed of Tripoli type)	740	230 0	25 6	steel	11 9	3	4200	4 6-pr. and 2 3-pr. Q.F., 3 M. . .	approved to be built			20·0	180	..
cr.	**Umbria** . . . P.	2245	262 6	39 6	„	15 6	2	6500	6 15-c.m. B.L.R., 4 12-c.m. do. . .	..	Bldg.	..	18·50	400	..
„	**Urania**	740	230 0	25 6	steel	11 9	3	4200	4 6-pr. and 2 3-pr. Q.F., 3 M. . .	5 f. tu. or l.car	Bldg.	..	20·00	180	..
d.v.	**Vedetta**	827	183 9	26 11	iron	11 5	1	670	4 12-c.m. B.L.R., 6 M. . . .	..	1866	..	11·00	137	..
to.r.cr.	**Vesuvio** . . . P.	3530	282 2	42 7	steel	19 0	2	7700	2 25-c.m. 28-ton B.L.R. (Armstrong), 6 15-c.m. 4-ton B.L.R. 8 Q.F. and M.	6 f. tu. or l.car	1886	64,000 (Engines)	17·00	590	..
fr.cr.	**Vettor Pisani** (Training ship)	1800	213 3	39 4	wood	17 0	1	1004	6 12-c.m. B.L.R., 4 M. . . .	..	1869	..	9·00	190	..
g.v.	**Volturno**	1040	177 3	32 8	steel	13 6	1	1100	6 5-inch B.L.R.	..	1887	..	12·00	197	..

Besides the ships of which the names are given in the foregoing tables, Italy has

Gunboats (*Staunch class*).—Guardiano and Sentinella; of 265 tons, and of 231 and 260 I.HP. respectively; 6 small gunboats of 87 tons and 52 HP.

Paddle despatch vessels.—Esploratore, Messaggiero; of 1245 tons, 1615 I.HP., and 15 knots speed.

Also transports, one being the Eritreo (late the America), of 9550 tons displacement, and 18 knots speed; torpedo depôt ship Vulcano; surveying vessel, training ships, Maria Adelaide, of 3429 tons, and the Vittoria Emanuele of 3076 tons, harbour and coasting-service craft, &c.

Torpedo boats.—First class, 95 built and building; of these five are 152½ ft. long, 16 ft. 9 inches broad, 128 tons displacement, 2000 HP., and 23 knots speed; nine are 135 ft. long, 14 ft. wide, displacement 110 tons, and 22·5 knots speed; 79 of 100 to 130 ft. long, and of 85 tons to 32 tons displacement, and 20 to 22½ knots speed; and the two others from 80 to 100 ft. long, of 32 tons displacement, and 21 knots speed; second class 22, all built of steel, displacement 13 to 31 tons, and with speeds from 16 to 21 knots.

Torpedo boats, wood. There are eight built or building of from 50 to 60 ft. long, of 11 tons displacement, and 16·5 knots speed.

There are nine merchant steamers of more than 3000 tons on the auxiliary list, viz., China, Manilla, Orione, Perses, Raffaele, Rubattino, Singapore, Siris, and Washington. Of these, three are fitted for two torpedo-launching apparatus.

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JAPAN.—Armoured Ships.

a.c., armoured cruiser; *a.g.b.*, armoured gunboat; *br.*, broadside ship; *c.b.*, central-battery ship; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery.					Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
Ram	**Adsuma** . . (iron) (was Stonewall Jackson)	1380	157 5	30 0	4	4	..	13 3	2	700	1 9-in. 13-ton M.L.R. (Armstrong), 4 6½-in. 5-ton do.	..	1864	..	9·00	..	..
c.b.	**Fu-Soo** . . . (iron)	3718	220 0	48 0	7	9	..	18 4	2	3500	4 24-c.m. 15-ton B.L.R. (Krupp), 2 17-c.m. 6-ton do., 6 l., 5 M.	..	1877	..	13·2	360	4500
a.c.	**Hi-yei** *. . (composite)	2200	231 0	40 9	4½	..	..	17 4	1	2490	3 17-c.m. 3½-ton B.L.R. (Krupp), 6 15-c.m. do.	..	1878	..	13·00	280	..
„	**Jho Sho** . (composite)	2700	216 0	38 0	4½	..	..	18 0	..	1000	3 17-c.m. 3½-ton M.L.R., 8 17-c.m. 2½-ton B.L.R., 2 l.	..	1869	..	12·00	300	..
„	**Kin-go** * . (composite)	2200	231 0	40 9	4½	..	..	17 4	1	2450	3 17-c.m. 3½-ton B.L.R. (Krupp), 6 15-c.m. do.	..	1877	..	13·70	280	..
br.	**Rio-jo** . . (composite)	1459	213 3	34 5	4½	4	..	17 4	1	975	2 17-c.m. 6-ton B.L.R. (Krupp), 6 70-pdr. (Vavasseur).	..	1864	..	9·00	350	..
a.g.b.	**Tisima**	1480	..	..	..	..	..	..	..	..	.. .. ..	..	1888	..	..	..	..

* These are not armoured ships in the usual sense of the term. There is no armour as against end-on fire, and no armoured deck.

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JAPAN.—Unarmoured Ships.

corv., corvette; *cr.*, cruiser; *d.v.*, despatch vessel; *g.v.*, gun-vessel; P., deck protected throughout; *pp.*, deck protected amidships only; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.							knots.	tons.	knots.
c.r.	**Akagi**	1760	230 0	33 0	steel	13 0	2	2300	4 6-inch B.L.R., 1 4¾-inch do.	..	1888	..	15·00	..	..
d.v.	**Amaki**	908	200 0	29 6	wood	13 9	1	720	1 15-c.m. B.L.R. (Krupp), 4 12-c.m. do. . .	..	1877	..	11·00	150	..
corv.	**Asama** (training ship) .	1104	206 9	33 9	„	10 10	1	300 (nom.)	8 17-c.m. B.L.R. (Krupp), 4 4½-in. do. (Armstrong), 4 l.	..	..	..	..	..	..
g.v.	**Banjo**	595	154 0	25 0	„	12 0	1	590	1 6-inch B.L.R., 1 4¾-inch do.	..	1879	..	10·00	107	..
d.v.	**Gwaki**	600	146 4	25 3	„	12 2	1	650	1 15-c.m. B.L.R. (Krupp), 2 12-c.m. do. . .	..	1888	..	10·00	..	..
g.v.	**Ho Sho**	470	120 0	24 0	„	9 6	1	240	2 M.L.R., 2 B.L.R.	..	1868	..	11·00	50	..
cr.	**Kaimon**	1490	210 0	32 0	„	16 5	1	1250	1 17-c.m. 6-ton B.L.R. (Krupp), 6 12-c.m. do., 2 l.	..	1882	..	12·00	..	..
g.v.	**Katsuraki** . . .	1476	206 9	36 0	composite	15 0	2	1600	2 17-c.m. B.L.R. (Krupp), 5 12-c.m. do.	..	1885	..	13·00	..	..
„	**Muzasi**	1476	206 9	36 0	„	15 0	2	1600	2 17-c.m. B.L.R. (Krupp), 5 12-c.m. do. .	..	1888	..	13·00	..	..
cr.	**Naniwa** . . P.	3650	300 0	46 0	steel	18 6	2	7235	2 26-c.m. 28 ton B.L.R. (Armstrong), 6 15-c.m. 5-ton (Krupp), 2 Q.F., 14 M.	4 f. tu. or l.car	1885	..	18·72	800	9000 at 13 kts.
d.v.	**Nis-chin**	874	204 0	29 0	wood	14 6	1	1270	1 7-in. M.L.R. (Armstrong) 6 30-pdr. (smoothbore)	..	..	..	11·00	..	..
„	**Sei-ki**	810	200 0	30 0	„	13 2	1	720	1 15-c.m. B.L.R. (Krupp), 4 12-c.m. do. .	..	1875	..	11·00	130	..
cr.	**Takao**	1760	230 0	33 0	composite	13 0	2	2330	4 6-in. B.L.R., 1 4¾-in. do. . . .	..	1885	..	15·00	..	..
„	**Takachiho** . . P.	3650	300 0	46 0	steel	18 6	2	7500	2 26-c.m. 28-ton F.L.R. (Armstrong), 6 15-c.m. 5-ton do., 2 Q.F., 14 M.	4 f. tu. or l.car	1885	..	18·72	800	9000 at 13 kts.
corv.	**Ten-rio**	1490	200 0	32 0	wood	16 5	1	1250	1 17-c.m. 6-ton B.L.R. (Krupp), 6 12-c.m. do., 2 l.	..	1882	..	12·00	..	..

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g.v.	Tscho-kai . . .	613	155	0	27	0	steel	9	0	1	950	1 21-c.m. B.L.R., 1 12-c.m. do., 2 M. . .	..	1887	..	10·00	..	..
„	Tsukushi . . .	1500	210	0	35	2	„	15	0	2	2887	2 10-in. 25-ton B.L.R. (Armstrong), 4 5-in. 4-ton do., 4 M., 2 l.	2 f. tu. or l.car	1882	..	17·00	250	..
„	Wun Yo	470	120	0	24	0	composite	11	0	1	..	4 M.L.R.	..	1868	..	10·00	60	..
„	Yamato	1476	206	9	36	0	„	15	0	1	1600	2 17-c.m. B.L.R. (Krupp), 5 12-c.m. do., 2 M.	2 f. tu. or l.car	1885	..	13·00	..	..
c.	Two ships not named *pp.*	4140	295	0	50	6	steel	21	2	2	5400	1 32-c.m. B L.R., 11 12-c m. do., 6 Q.F., 12 M.	4 f. tu. or l.car	Bldg.	..	16·00	..	..

Paddle despatch vessel.—Jungei, 1465 tons; 1430 horse-power; Kasuga, 1015 tons; 300 nominal horse-power.

Gunboats.—Ho-scho, Moschum, Raiden, Tschintagata; 100 to 375 tons; 60 to 80 nominal horse-power; and the Atago and Maja, 620 tons and 700 indicated horse-power; 3 B.L. guns.

Also yachts, training-ships, transports, &c.

Torpedo boats.

One built in this country and sent out in pieces and reinstated in Japan, 166 ft. long, 19½ ft. broad, of 200 tons displacement, 1600 horse-power, and 20 knots speed.

Four sea-going torpedo boats of 110 tons, and 19 to 20 knots.

Seventeen other first class boats and 5 second class boats.

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MEXICO.—Unarmoured Ships.

g.v., gun-vessel.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	**Democrata**	450	140 0	24 10	iron	11 2	1	600	2 6½-in. 4-ton M.R.L., 2 20-pdr. B.L.R. (Vavasseur)	..	1875	..	11·00	..	..
,,	**Mexico**	450	140 0	24 10	,,	11 2	1	600	2 6½-in. 4-ton M.R.L., 2 20-pdr. B.L.R. (Vavasseur)	..	1875	..	11·00	..	..

Mexico has also two 10-knot gunboats of small size, the Independencia and the Libertad, 125 ft. long and of 425 horse-power.

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NETHERLANDS.—Armoured Ships.

a.g.b., armoured gunboat; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour. Belt.	Armour. Turret.	Backing.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Discharges	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.s.t.	Bloedhond . (iron)	1530	180 0	46 3	5½	8	9¾	9 6	2	680	1 28-c.m. 28-ton B.L.R. (Krupp), 2 M.	..	1869	..	8·50	90	..
„	Buffel . . (iron)	2198	195 6	40 0	6	8	9¾	15 6	2	2000	2 23-c.m. 13-ton M.L.R. (Armstrong), 2 M.	..	1868	..	12·40	150	..
„	Cerberus . . (iron)	1530	180 0	44 0	5½	8	9¾	9 7	2	617	1 28-c.m. 28-ton B.L.R. (Krupp), 2 M.	..	1869	..	8·50	90	..
„	Draak . . (iron)	2156	201 5	49 3	8	9	11¾	10 10	2	807	2 28-c.m. B.L.R. (Krupp), 2 M.	..	1877	..	8·00	100	..
„	Guinea . . (iron)	2378	195 6	40 0	6	8	9¾	16 9	2	2000	2 23-c.m. 13-ton B.L.R. (Armstrong), 2 M.	..	1870	..	12·00	135	..
„	Haai . . (iron)	1566	186 4	44 0	5½	8 5½ C. Tower	9¾	10 2	2	672	2 23-c.m. 13-ton B.L.R. (Armstrong), 2 M.	..	1871	..	7·00	70	..
„	Heiligerlee . (iron)	1530	180 0	43 7	5½	8 4½ C. Tower	9¾	9 6	2	630	2 23-c.m. 13-ton B.L.R. (Armstrong), 2 M.	..	1868	..	8·00	90	..
„	Hijena . . (iron)	1566	186 4	44 0	5½	8 5½ C. Tower	9¾	10 2	2	654	2 23-c.m. 13-ton M.L.R. (Armstrong), 2 M.	..	1871	..	7·00	70	..
a.g.b.	Isala . . (iron)	367	150 11	24 11	4	5	5	4 3	2	306	2 12-c.m. B.L.R. (Krupp) . .	..	1876	..	7·00	27	..
t.	Koning der Nederlander (iron)	5400	269 0	49 3	8	9 8 Pt. House.	11¾	20 0	2	4500	4 28-c.m. 25-ton M.L.R. (Armstrong), 4 12-c.m. B.L.R. (Krupp)	..	1874	..	11·00	620	..
c.s.t.	Krokodil . (iron)	1530	180 0	43 7	5½	8 4½ C. Tower	9¾	9 6	2	630	2 23-c.m. 13-ton B.L.R. (Krupp), 2 M.	..	1868	..	8·00	90	..
„	Luipard . . (iron)	1525	186 4	44 0	5½	8 5½ C. Tower	9¾	9 2	2	680	1 28-c.m. 28-ton B.L.R. (Krupp), 2 M.	..	1876	..	7·00	70	..

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NETHERLANDS.—Armoured Ships—*continued.*

a.g.b., armoured gunboat; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour. Belt.	Armour. Turret.	Backing.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.s.t.	**Matador** . . (iron)	1935	201 5	49 3	5½	9	9¾	10 2	2	691	2 28-c.m. 28-ton B.L.R. (Krupp), 2 M.	..	1878	..	7·00	100	..
a.g.b.	**Merva** . . (iron)	367	150 11	24 11	4	5	5	4 3	2	395	2 12-c.m. B.L.R. (Krupp) . .	..	1879	..	7·00	27	..
„	**Mosa** . . (iron)	367	150 11	24 11	4	5	5	4 3	2	400	2 12-c.m. B.L.R. (Krupp) . .	..	1878	..	7·00	27	..
c.s.t.	**Panter** . . (iron)	1566	186 4	44 0	5½	8 5½ C. T.	9¾	10 2	2	660	2 23-c.m. 13-ton B.L.R. (Armstrong), 2 M.	..	1870	..	7·00	70	..
t.	**Prinz Hendrik der Nederlander** (iron)	3375	229 7	42 7	4½	5½	9¾	18 1	1	2000	4 23-c.m. 13-ton M.L.R. (Armstrong), 4 12-c.m. B.L.R. (Krupp)	..	1866	..	12·00	350	..
a.g.b.	**Rhenus** . . (iron)	367	150 11	24 11	4	5	5	4 3	2	310	2 12-c.m. B.L.R. (Krupp) . .	..	1877	..	7·00	27	..
c.s.t.	**Schorpioen** . (iron)	2175	193 3	38 0	6	8 4½ Pt. Tower.	11¾	15 10	2	2225	2 28-c.m. 28-ton B.L.R. (Krupp) .	..	1868	..	12·00	200	1030
„	**Stier** . . . (iron)	2069	194 10	38 0	6	8 4½ P. T.	9¾	15 6	2	2257	1 28-c.m. 28-ton B.L.R. (Krupp), 2 M.	..	1868	..	12·40	160	..
„	**Tijger** . . (iron)	1414	187 0	44 0	5½	8 4½ C. T.	9¾	8 10	2	684	2 23-c.m. 13-ton M.L.R. (Armstrong), 2 M.	..	1868	..	8·00	70	..
a.g.b.	**Vahalis** . . (iron)	340	120 5	27 6	4½	..	7	5 3	2	243	2 7½-c.m. B.L.R. (Krupp) . .	..	1870	..	6·00	22	..
c.s.t.	**Wesp** . . (iron)	1566	186 4	44 0	5½	8	9¾ 5½ C. T.	10 2	2	744	1 28-c.m. 28-ton B.L.R. (Krupp), 2 M.	..	1871	..	7·00	70	..

A coast defence ironclad of 2500 tons displacement, 15 knots speed, and to carry two 11-inch 28-ton Krupp B.L.R. guns has been laid down.

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((I) denotes vessels of the Dutch Indian Navy.)
corv., corvette; *fr.cr.*, frigate-built cruiser; *cr.*, cruiser; *g.v.*, gun-vessel; *sl.*, sloop.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
sl.	**Alkmaar**	1010	154 3	30 2	composite	15 9	1	830	1 15-c.m. B.L.R., 6 12-c.m. do. (Krupp)	..	1874	..	10·00	130	..
g.v.	**Arend (I)**	340	125 0	21 0	„	10 0	1	320	2 3-inch M.L., 2 l.	..	1880	..	10·50	..	..
„	**Argus (I)**	270	102 0	22 3	iron	8 0	1	170	.. ..	..	1868	..	8·00	60	..
„	**Aruba**	770	147 7	29 6	composite	12 5	1	413	1 15-c.m. M.L.R. (Armstrong), 2 12-c.m. B.L.R. (Krupp), 2 M.	..	1873	..	9·00	100	..
fr.cr.	**At-jeh**	3160	262 5	39 4	iron & wood	20 7	1	2700	6 17-c.m. 6-ton B.L.R., 8 12-c.m. do. (Krupp), 6 M.	..	1876	..	14·50	380	3000
g.v.	**Bali (I)** (was Eustatius)	853	147 7	29 6	„	11 10	1	516	1 15-c.m. B.L.R., 3 12-c.m. do. (Krupp), 2 M.	..	1878	..	9·50	100	..
„	**Banda (I)**	695	137 10	27 7	composite	11 10	1	198	1 16-c.m. M.L.R., 2 12-c.m. B.L.R. (Krupp)	..	1872	..	9·00	80	..
„	**Bandjermassin (I)**	732	137 10	28 10	„	11 10	1	370	1 18-c.m. 7-ton M.L.R. (Armstrong), 2 12-c.m. B.L.R. (Krupp).	..	1874	..	9·50	85	..
„	**Batavia (I)**	853	147 7	29 6	iron & wood	11 10	1	405	1 18-c.m. 7-ton M.L.R. (Armstrong), 2 12-c.m. B.L.R. (Krupp).	..	1876	..	9·00	100	..
„	**Bencoolen (I)**	853	147 7	29 6	„	11 10	1	516	1 15-c.m. B.L.R., 3 12-c.m. do (Krupp)	..	1879	..	9·60	100	..
„	**Bonaire**	853	147 7	29 6	iron & wood	11 10	1	412	1 15-c.m. B.L.R., 3 12-c.m do. (Krupp), 2 M.	..	1877	..	9·00	100	..
„	**Ceram (I)**	550	157 4	25 4	steel	10 6	1	650	3 12-c.m. B.L.R. (Krupp), 4 M.	..	1887	..	11·00	60	..
„	**Condor (I)**	320	126 0	21 0	composite	10 0	1	300	2 2¾-in. B.L.R., 2 6-Pr. Q.F.	..	1885	..	10·00	25	..
corv.	**Curaçoa (I)**	2030	190 3	39 4	wood	18 4	1	680	8 16-c.m. M.L.R.	..	1863	..	..	..	..
fr.cr.	**De Ruyter**	3160	262 5	39 4	iron & wood	20 7	1	3305	6 17-c.m. 6-ton B.L.R., 8 12-c.m. do. (Krupp), 4 M.	..	1880	..	14·50	380	3000
g.v.	**Flores (I)**	550	157 0	25 6	steel	10 6	1	650	3 4¾-in. 2-ton B.L.R.	..	1887	..	11·00	60	..
„	**Halik (I)**	..	125 0	20 0	composite	10 0	1	..	.. ..	..	1878	..	8·50	..	..

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NETHERLANDS.—Unarmoured Ships—*continued.*

((I) denotes vessels of the Dutch Indian Navy.)
corv., corvette; *fr.cr.*, frigate-built cruiser; *cr.*, cruiser; *g.v.*, gun-vessel; *sl.*, sloop.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
cr.	Java (I) . . .	1100	197 0	31 3	iron & wood	12 3	1	1020	1 6-in. B.L.R., 3 4¾-in. do. . . .	..	1885	..	10·60	125	..
fr.cr.	Johan Willem Friso	3160	262 5	39 4	„	20 7	1	3000	6 17-c.m. 6-ton B.L.R., (Krupp), 8 12-c.m. do. 4 M.	..	1886	..	14·50	380	3000
„	Koningin Emma der Nederlanden	3160	262 5	39 4	„	20 7	1	2750	6 17-c.m. 6-ton B.L.R., 8 12-c.m. do. (Krupp), 4 M.	..	1879	..	14·60	380	3000
corv.	Leeuwarden . .	2030	190 3	39 4	wood	18 4	1	738	4 16-c.m. B.L.R., 6 12-c.m. do. (Krupp), 2 M.	..	1861	..	8·00	..	..
g.v.	Macassar (I) . .	853	147 7	29 6	iron & wood	11 10	1	394	1 18-c.m. 7-ton M.L.R. (Armstrong), 2 12-c.m. B.L.R. (Krupp)	..	1876	..	9·00	100	..
„	Madura (I) . .	853	147 7	29 6	„	11 10	1	559	1 15-c.m. B.L.R., 3 12-c.m. do. (Krupp) .	..	1880	..	9·70	100	..
„	Padang (I). . .	853	147 7	29 6	„	11 10	1	409	1 15-c.m. B.L.R., 3 12-c.m. do. (Krupp) .	..	1878	..	9·40	100	..
„	Palembang (I) . .	732	137 10	28 10	composite	11 10	1	370	1 18-c.m. 7-ton M.L.R. (Armstrong), 2 12-c.m. B.L.R. (Krupp)	..	1874	..	8·50	85	..
„	Pontianak (I) . .	832	147 7	29 6	„	11 10	1	360	1 18.-c.m. 7-ton M.L.R. (Armstrong), 2 12-c.m. B.L.R. (Krupp)	..	1873	..	8·50	85	..
„	Riow (I) . . .	832	147 7	29 6	„	11 10	1	204	1 16-c.m. M.L.R., 2 12-c.m. B.L.R. (Krupp)	..	1872	..	8·00	80	..
„	Samarang (I) . .	853	147 7	29 6	iron & wood	11 10	1	460	1 18-c.m. 7-ton M.L.R. (Armstrong), 2 12-c.m. B.L.R. (Krupp)	..	1876	..	9·00	100	..
„	Sambas (I) . . .	732	137 10	28 10	composite	11 10	1	374	1 18-c.m. 7-ton M.L.R. (Armstrong), 2 12-c.m. B.L.R. (Krupp)	..	1874	..	8·50	85	..

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..																		
„	Surinam . . .	853	147	7	29	6	„	11	10	1	440	1 15-c.m. B.L.R. (Krupp), 3 12-c.m. do., 2 1.	..	1877	..	9·00	98	..
fr.cr.	Tromp. . . .	3160	262	5	39	4	„	20	7	1	2772	6 17-c.m. 6-ton B.L.R., 8 12-c.m. do. (Krupp), 4 M.	..	1877	..	14·30	380	3000
corv.	Van Galen . . .	2160	193	6	41	6	wood	18	2	1	833	4 16-c.m. B.L.R., 6 12-c.m. do (Krupp), 2 M.	..	1872	..	10·00	400	..
fr.cr.	Van Speyk . . .	3160	262	5	39	4	iron & wood	20	7	1	3000	6 17-c.m. 6-ton B.L.R., 8 12-c.m. do. (Krupp), 4 M.	..	1882	..	14·20	380	3000
g.v.	Zeemeeuv (I) . .	340	125	0	20	0	composite	10	6	1	..	.. ..	..	1878	..	8·00	..	..
corv.	Zilveren Kruis . .	2160	193	6	41	7	wood	18	4	1	1440	4 16-c.m. B.L.R., 6 12-c.m. do. (Krupp), 4 M.	..	1869	..	10·00	300	..
g.v.	Zwalur (I) . . .	340	123	0	21	0	composite	10	0	1	320	2 3-inch B.L.G., 2 2-inch do. . . .	..	1882	..	10·50	..	..

Gunboats (*Staunch class*)—Balder, Braga, Bulgia, Dufa, Freijr, Hadda, Hefring, Heimdall, Njord, Thor, Tijr, Udur, Ulfr, Vali, Vidr, Wodan, of 245 tons; also, Bever, Brak, Das, Dog, Ever, Fret, Geep, Gier, Havik, Hydra, Lynx, Raaf, Sperwer, Vos, of 195 tons.

Steel gunboat.—"No. 3," 108 tons and 172 I.HP.

First-class torpedo boats, nine seagoing, of about 80 tons displacement, and 20 to 21 knots (built and building); two of 46 tons displacement and 21½ knots; and 20 boats of 29 tons displacement and 17 knots.

Also several large paddle steamers, training ships, transports, store-ships, surveying vessel, &c.

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NORWAY.—Armoured Ships.

c.s.,t., coast-service turret ship.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Turret.	Belt.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.s., t.	Mjolner	1515	203 5	45 11	12	5	39	11 10	1	450	2 27-c.m. 18-ton M.L.R. (Armstrong), 1 M., 1 l.	..	1868	66,800	8·00	138	..
,,	Skorpionen	1447	200 2	45 11	12	5	39	11 6	1	350	2 27-c.m. 18-ton M.L.R. (Armstrong), 1 M., 1 l.	..	1866	..	6·00	138	..
,,	Thor	2003	203 5	49 3	14½	7	38	13 2	1	600	2 27-c.m. 20-ton M.L.R. (Armstrong), 1 M., 1 l.	..	1872	..	8·00	200	..
,,	Thrudvang	1515	200 2	45 11	12	5	39	11 10	1	500	2 27-c.m. 18-ton M.L.R. (Armstrong), 1 M., 1 l.	..	1867	..	8·00	138	..

NOTE.—All the ships named above are built of iron.

NORWAY.—Unarmoured Ships.

corv., corvette; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; *sl.*, sloop; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	tons.	tons.	knots.
g.v.	Ellida	1000	187 0	32 8	wood	14 4	2	900	5 15-c.m. 4-ton Krupp, 1 12-c.m. do., 1 l., 2 M.	1 f. tu. or l.car	1880	..	12·00	97	..
fr.cr.	Kong Sverre	3472	252 7	49 3	,,	22 4	1	1800	2 20-c.m. 7-ton M.L.R. (Armstrong), 4 17-c.m. M.L.R., 16 16-c.m. do., 22 8-in. smooth-bore, 6 l.	..	1860	..	11·00	377	..
corv.	Nord Stjernen	1609	216 6	39 4	,,	17 9	1	800	4 16-c.m. 3-ton M.L.R., 10 8-in. smooth-bore, 3 l.	..	1862	..	9·00	195	..
sl.	Nornen	958	173 10	36 0	,,	15 9	1	280	4 16-c.m. M.L.R., 10 8-in. smooth-bore. 3 l.	..	1855	..	7·00	54	..
fr.cr.	St. Olaf	2182	229 7	42 7	,,	18 9	1	1200	1 20-c.m. 7-ton M.L.R. (Armstrong), 1 17-c.m. 5-ton, M.L.R., 12 16-c.m. 3-ton do., 20 8-in. 3-ton smooth-bores, 4 l.	..	1856	..	10·00	200	..
g.v.	Sleipner	580	173 10	25 11	iron	9 6	2	800	1 26-c.m. 22-ton B.L.R., 1 15-c.m. 4-ton do. (Krupp), 1 M.	1 f. tu. or l.car	1877	..	12·00	80	..

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In addition to the ships and vessels given in the alphabetical lists, the Norwegian Navy possesses the following:—

Eleven Gunboats.—Brage, Glommen, Gor, Lougen, Nor, Riukan, Sarpen, Tyr, Uller, Vale, Vidar (189 to 280 tons; 100 to 450 indicated horse-power), one large gun and machine guns in each.

Sixteen smaller Gunboats.—Aasgardsrand, Arendal, Brevig, Dverg, Horten, Karmo, Kongsberg, Kristiansand, Langesund, Laurvig, Lillesand, Nök, Porsgrund, Skien, Skudernoes, Tönsberg (55 tons, 70 indicated horse-power, 7½ knots); each armed with one 5½-inch gun. Trold (97 tons; 65 indicated horse-power); also several smaller gun boats.

Torpedo boats.—Fifteen first-class; three second-class; and two Miners.

Also paddle steamer, transport, training ships, &c.

PERU.

Since the war with Chili the Peruvian Navy has been much reduced, and comprises only the following seagoing steamers:—

Diogenes and Lima (late Socrates), built in 1881, of 1700 tons displacement, 1800 horse-power, and 16-knot speed; also Callao, Colon, Duque de Guisa, Iquique, Lerzundi, Rimac (2100 tons, 13 knots), Tumbez, and the training frigate Apurimac.

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PERSIA.

d.v., despatch vessel.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
d.v.	**Persepolis** . . .	1200	206 9	34 2	steel	19 7	1	454	1 10-c.m. B.L.R. (Krupp), 4 7-c.m. do . .	..	1885	..	10·00	..	..

Also one small double-screw steamer for police duties, and a small 7-knot gunboat.

PORTUGAL.—Armoured Ship.

c.b., central battery-ship.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery.					Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.b.	**Vasco da Gama** (iron) .	2422	200 0	40 0	9	10	..	18 0	2	3605	2 26-c.m. 18-ton B.L.R. (Krupp), 2 15-c.m. do., 3 40-pdr. B.L.R. (Armstrong), 1 M.	..	1876	103,800	13·20	300	..

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corv., corvette; *g.v.*, gun-vessel; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
corv.	Affonso de Albuquerque	1111	205 0	33 2	iron & wood	12 3	1	1055	2 6-in. B.L.R. (Armstrong), 5 5-in. do., 3 M.	..	1884	..	12·00	150	..
„	Bartholomeu Dias .	1243	207 0	37 5	wood	20 6	1	400 (nom.)	1 6-in. B.L.R., 10 40-pdrs. . . .	..	1858	..	10·00	360	..
g.v.	Bengo. . . .	462	125 7	24 7	composite	8 10	1	400	1 6-in. B.L.R., 2 15-c.m. do. . . .	..	1879	..	10·00	80	..
„	Cacongo . . .	580	141 0	24 9	steel	10 8	1	400	2 6-in. 4-ton B.L.R.	..	1886	..	11·00	..	..
„	Diego Cam . .	587	143 0	25 11	composite	10 10	1	400	2 15-c.m. 4-ton B.L.R.	..	1888	..	9·00	..	..
„	Douro . . .	587	143 0	25 11	„	10 10	1	400	2 15-c.m. 4-ton B.L.R.	..	1873	..	9·00	80	..
corv.	Duque de Terceira .	1418	180 2	34 2	wood	14 9	1	220 (nom.)	1 17-c.m. M.L.R. (Armstrong), 4 40-pdr. do.	..	1864	..	10·00	200	..
„	Estephania . .	2368	202 5	41 4	„	17 8	1	400 (nom.)	9 80-pdr. M.L. (Palliser) . . .	..	1859	..	10·00	360	..
g.v.	Liberal . . .	610	140 0	25 10	iron & wood	11 0	1	500	1 6-in. 4-ton B.L.R. (Armstrong), 6 M., 2 l.	..	1884	..	10·00	90	..
corv.	Mindello . . .	1124	169 11	35 9	composite	13 5	1	900	2 7-in. 4-ton M.L.R. (Armstrong), 4 20-pdr. do. 2 l.	..	1876	..	11·00	100	..
g.v.	Mondovi . . .	462	125 7	24 7	„	8 10	1	400	1 6-in. B.L.R., 2 M., 2 l.	..	1879	..	10·00	80	..
„	Quanza . . .	587	143 0	25 11	„	10 10	1	100 (nom.)	3 15-c.m. 4-ton B.L.R.	..	1877	..	8·00	80	..
corv.	Rainha de Portugal .	1124	169 11	35 9	„	13 5	1	900	2 7-in. M.L.R. (Armstrong), 4 20-pdr. do., 2 l.	..	1876	..	11·00	100	..
g.v.	Rio Ave . . .	380	120 0	22 0	„	10 0	1	300	1 64-pdr. M.L.R., 2 40-pdr. do.	..	1880	..	8·00	65	..
„	Rio Lima . . .	610	148 11	28 3	„	10 6	1	500	1 15-c.m. 4-ton B.L.R. (Armstrong), 4 40-pdr. do.	..	1875	..	10·00	90	..
„	Sado	610	148 11	28 3	„	10 6	1	500	1 15-c.m. 4-ton B.L.R. (Armstrong), 4 40-pdr. do.	..	1875	..	10·00	90	..
„	Tamega . . .	610	148 11	28 3	„	10 6	1	500	1 15-c.m. 4-ton B.L.R. (Armstrong), 4 40-pdr. do.	..	1875	..	10·00	90	..
„	Tejo	587	143 0	25 11	„	10 10	1	400	2 15-c.m. 4-ton B.L.R.	..	1869	..	10·00	80	..
„	Vouga . . .	721	161 0	27 7	iron & wood	11 10	1	600	1 6-in. B.L.R., 2 M., 4 l.	..	1882	..	9·00	100	..
„	Zaire	640	140 0	25 10	„	11 10	1	500	1 6-in. B.L.R. (Armstrong), 6 M., 2 l. .	..	1884	..	10·00	20	..
„	Zambezia . . .	590	143 0	26 0	composite	10 10	1	400	2 6-in. B.L.R., 6 M.	...	1886	..	9·00	80	..

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Gunboats.—Two building of steel, of 220 tons displacement and 380 horse-power.

Torpedo boat.—Espadarte, first class, 86 ft. long, of 19 knots speed.

Three torpedo boats, 110 feet long, 12 feet broad, 65 tons displacement, 700 indicated horse-power, 20 knots speed, built at Poplar in 1886.

Torpedo vessel or Miner.—Fulminante.

Three transports, seven screw steamers built and building, besides training ships, yachts, &c.

ROUMANIA.

The Kingdom of Roumania has—

The Elizabeta, a protected cruiser, 230 ft. long, 32 ft. 10 in. broad, 1320 tons displacement, 4500 horse-power, 18 knots speed, and carrying 4 17-cm. B.L.R. guns, 8 machine guns, and 4 torpedo launching tubes. Also

Three coast-guard vessels—Olthul, Siretul, and Bistrita—length, 100 ft.; breadth, 13½ ft.; draught of water, 6 ft.; speed, 11 knots natural draught, and 13¼ knots with forced draught; indicated horse-power corresponding to 11 knots speed was 160. They carry 3 machine guns. They were built by the Thames Ironworks Co., and left the Thames in August, 1888.

There are also

Five gunboats of small size (45 to 110 tons).

Two paddle yachts, Romania and Stefancel Mare.

One screw steamer (two guns, two machine guns).

One towing torpedo steamer.

Three first-class torpedo boats, 120 ft. long, 56 tons displacement, and 21 knots speed.

Two second-class torpedo boats.

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RUSSIA.—Armoured Ships.

(B.S., Black Sea Fleet.) *a.c.*, armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *br.*, broadside ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l car., fixed tube or launching carriage for Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour. Belt.	Armour. Turret or Battery.	Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns. B.L.R. are of Russian Krupp pattern.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.	inches.	inches.	ins.	ft. in.						£	knots.	tons.	knots.
c.s., t.	Adm. Chichagoff (iron)	3511	254 3	42 7	6	6	17½	18 9	1	2060	2 11-in. 28-ton B.L.R., 3 M., 4 l.	..	1868	..	10·00	300	..
„	Adm. Greig . (iron)	3593	252 7	42 7	4½	6	17½	20 11	1	2031 3	11-in. 28-ton B.L.R., 3 M., 4 l.	..	1868	..	10·00	300	..
„	Adm. Lazareff (iron)	3556	252 7	42 7	4½	6	17½	20 4	1	2004	3 11-in. 28-ton B.L.R., 4 l. .	..	1867	..	10·00	300	..
a.c.	Admiral Nachimoff (steel and iron and wood sheathed) . . .	7782	330 0	61 0	10	8 barbette	3-in. steel dk.	25 9	2	8000	8 8-in. 9-ton B.L.R., 10 6-in. 4-ton do., 6 M., 4 l.	4 f. tu. or l.car	1885	572,000	16·50	1200	..
c.s., t.	Adm. Spiridoff (iron)	3740	254 3	42 7	6	6	17½	19 1	1	2007	2 11-in. 28-ton B.L.R., 3 M., 4 l.	..	1868	..	10·00	300	..
b.	Alexander II. (steel and wood sheathed)	8440	350 0	67 0	14	10 barbette 6 battery 4-inch armour in each of the 9-in. guns	2½-in steel dk.	23 0	2	8000	2 12-in. B.L.R., 4 9-in. do., 8 6-in. do., 10 Q.F., 4 M., 4 l.	4 f. tu. or l.car	1887	..	15·50	..	..
c.s., t.	Bronenosetz . . (iron)	1482	200 0	45 11	5 1-in. plates	11 1-in. plates	..	12 2	1	481	2 9-in. 15-ton B.L.R. . .	..	1864	..	7·00	..	..
b.	Catherine II. B.S. (iron and steel)	10,150	339 6	69 0	16	14 barbette	12-in. and 3-in. steel dk.	26 0	2	11,000	6 12-in. (50-ton) B.L.R., 7 6-in. 4-ton do., 7 M.	7 f. tu. or l.car	1886	900,000	16·00	886	1350 at 14 knots
c.s., t.	Charodeika . (iron)	2026	206 9	42 7	4½	6 turret	17½	12 2	2	786	4 9-in. 15-ton B.L.R., 1 M. .	..	1867	..	8·00	250	..
a	Dimitri Donskoi (iron and steel wood sheathed)	5893	296 5	52 0	6	unarmoured	steel dk. 2½-in	24 4	2	7000	2 8-in. 9-ton B.L.R., 14 6-in. 4-ton do., 10 M., 4 l.	4 f. tu. or l.car	1883	..	15·50	400	4800
c.s., t.	Edinorog . (iron)	1407	200 0	45 11	5 1-in. plates	11 1-in. plates	39	..	1	460	2 9-in. 15-ton B.L.R. . .	..	1864	..	6·00	..	..
a.c.	Gangoot . . .	6592	275 0	62 0	partial belt	armoured casemate	..	21 0	..	..	6 9-in. 15-ton B.L.R., 6 6-in. do.	..	Building at the Admiralty Works, St. Petersburg		..	..	
„	General Admiral (iron and wood)	4604	285 5	49 3	6	unarmoured	9¼	22 11	1	4472	6 8-in. 9-ton B.L.R., 2 6-in. do., 7 M., 5 l.	2 f. tu. or l.car	1873	..	12·00	1000	..

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RUSSIA.—Armoured Ships—*continued.*

(B.S., Black Sea Fleet.) *a.c.*, armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *br.*, broadside ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour. Belt.	Armour. Turret or Battery.	Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns. B.L.R. are of Russian Krupp pattern.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.	inches.	inches.	ins.	ft. in.						£	knots.	tons.	knots.
a.c.	**Gerzog Edinburgski** (iron and wood)	4604	285 5	49 3	6	unarmoured	9¾	22 11	1	5222	4 8-in. 9-ton 6 6-in. 4-ton B.L.R., 2 M., 6 l.	2 f. tu. or l.car	1875	..	12·50	1000	..
c.b.	**Kniaz Pojarski** (iron)	5007	272 4	49 3	4½—3½	4½	..	23 11	1	new machinery	8 8-in. 9-ton B.L.R., 2 6-in. 4-ton do., 4 M., 8 l.	..	1867	..	12·50	600	..
c.s., t.	**Koldun** . . .(iron)	1666	200 0	45 11	5 1-in. plates	11 1-in. plates	39	12 0	1	481	2 9-in. 15-ton B.L.R. . .	..	1864	..	6·00	..	..
c.s., br.	**Kreml** . . .(iron)	3664	219 10	52 5	4½	4½	17½	17 4	1	1121	14 8-in. 9-ton B.L.R., 2 M., 6 l.	..	1864	..	6·00	..	..
c.s., t.	**Latnik** . . .(iron)	1515	200 0	45 11	5 1-in. plates	11 1-in. plates	39	12 2	1	490	2 9-in. 15-ton B.L.R. . .	..	1864	..	6·00	..	..
„	**Lava** . . .(iron)	1591	200 0	45 11	5 1-in. plates	11 1-in. plates	39	12 0	1	335	2 9-in. 15-ton B.L.R., 2 M. .	..	1864	..	6·00	..	..
a.c.	**Minin** . . .(iron)	6168	298 6	49 3	7	unarmoured	..	25 3	1	5290	4 8-in. 9-ton B.L.R., 12 6-in. 4-ton do., 3 M., 4 l.	..	1878 altered	..	13·00	..	..
c.s., br.	**Netron-Menya** .(iron)	3494	219 10	53 0	4½	4½ battery	9¾	16 5	1	1632	12 8-in. 9-ton B.L.R., 2 M., 4 l.	..	1864	..	8·00	500	..
a.c.	New Ship . . .	9000	..	..	..	..	..	..	..	..	4 9-in. 15-ton B.L.R., 20 6-in. do.	..	Building at Baltic Works		18·0	..	..
„	New Ship . . .	6592	275 0	62 0	..	..	..	21 0	..	..	6 9-in. 15-ton B.L.R., 6 6-in. do.	..	Building at Franco-Russian Works		..	..	..
a.c.	**Nicolai I.** (steel and wood sheathed)	8440	326 0	67 0	14	10 barbette 6-in. battery	2½-in. steel dk.	..	2	8000	2 12-in. B.L.R. 4 9-in. do., 8 6-in. do., 4 Q.F., 6 M., 4 l.	4 f. tu. or l.car	Bldg.*	453,000	15·00	..	..
a.g.b.	**Nikopol,** B.S. (iron & wood)	273	98 5	27 10	3	..	9¾	5 0	2	320	.. ..	..	1868	..	8·00	..	..
circular c.s.	**Novgorod,** B.S. (iron and wood)	2706	101 0	101 0	9—7 with Hughes' Backing.	9	†	13 5	6	2000	2 11-in. 29-ton B.L.R., 2 M., 2 l.	..	1873	..	6·00	200	..
a.c.	**Pamyat Azova** (steel)	6000	378 0	50 0	9	8 barbette	10-in. 2½-in. steel dk.	25 0	2	11500	2 8-in 9-ton B.L.R., 16 6-in. 4-ton do., 10 Q.F. and M.	1 f. tu. 2 l. car	1887	..	18·00	1000	12,000
c.s., t.	**Perun** . . .(iron)	1549	200 0	45 11	5 1-in. plates	11 1-in. plates	..	12 2	1	338	2 9-in. 15-ton B.L.R. . .	..	1864	..	6·00	..	..

* Will be launched in 1889 as soon as the Neva ice breaks up.

† Hughes' Backing.

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t.	**Peter the Great**	.(iron)	8749	328	2	62	4	14—8	8+6 turret	9¾	23	0	2	8258	4 12-in. 40-ton B.L.R., 4 M., 4 l.	1 f. tu. or l.car	1872	..	13·00	1200	..
br.	**Petropaulowski**‡	(wood)	6240	294	0	56	0	4½	4½	..	24	0	1	2800	21 8-in. 9 ton B.L.R., 1 6-in do.	..	1865	..	11·00	..	..
c.s.	**Pervenetz** .	.(iron)	3279	219	10	52	5	4½	4½	9¾	14	9	1	1067	1 9-in. M.L.R., 10 8-in. 9-ton B.L.R., 2 6-in. 4-ton do., 9 M., 4 l.	..	1863	..	9·00	..	..
c.s., t.	**Rusalka** . .	.(iron)	2026	206	9	42	7	4½	6 turret	17½	12	9	2	786	4 9-in. 15-ton B.L.R., 2 M. .	..	1867	..	8·00	250	..
c.s., br.	**Sevastopol**‡ .	(wood)	6210	295	0	52	0	4½	4½	..	25	6	1	3090	10 8-in. 9 ton. B.L.R. . .	..	1863	..	12·00	..	..
b.	**Sinope**, B.S.	(iron & steel)	10,150	339	6	69	0	16	14 barbette	12-in. 13-in. steel dk.	26	6	2	13000	6 12-in. 50-ton B.L.R., 7 6-in. 4-ton do., 7 M.	7 f. tu. or l.car	1887	900,000	16·75	886	1350 at 14 kts.
a.g.b	**Sistovo**, B.S. .	.(iron)	384	105	0	30	10	3	..	9¾	5	11	2	250	.. ..	..	1868	..	8·00	..	..
c.s., t	**Smertch** . .	.(iron)	1520	187	0	39	4	4½	6 turret	7¾	11	6	2	700	2 9-in. 15-ton B.L.R., 1 M. .	..	1864	..	8·00	250	..
„	**Strelets** . .	.(iron)	1431	200	0	45	11	5 1-in. plates	11 1-in. plates	39	11	6	1	444	2 9-in. 15-ton B.L.R. . .	..	1864	..	6·00	..	..
b.	**Tchesmé**, B.S..	(iron & steel)	10,150	339	6	69	0	16	14 barbette	12-in. 3-in. steel dk.	26	6	2	11000	6 12-in. (50 ton) B.L.R., 7 6-in. 4-ton do., 7 M.	7 f. tu. or l.car	1886	900,000	16·00	886	1350 at 14 kts.
c.s., t.	**Tifun** . .	.(iron)	1666	200	0	45	11	5 1-in. plates	11 1-in. plates	39	12	5	1	453	2 9-in. 15-ton B.L.R., 1 M. .	..	1864	..	6·00	..	..
b.	**Twelve Apostles** . .		8076	..		..		14	12 (tower 5-in.)		..		..	8500	.. ..	..	Bldg. at Nicholaif		..	..	..
a.g.b.	Not named . . .		1492	..		..		..	..	..	..		..	..	.. ..	..	Building at Admlty. Works		..	..	..
„	Not named . . .		1492	..		..		..	..	..	..		..	..	.. ..	..	Bldg. at Sebastopol		..	..	..
„	Ironclad (not named) .		10,000	..		..		..	..	..	..		..	..	.. ..	..	To be laid down at Sebastopol		..	..	..
„	**Uragan** . .	.(iron)	1415	200	0	45	11	5 1-in. plates	11 1-in. plates	39	11	6	1	432	2 9-in 15-ton B.L.R. . .	..	1864	..	6·00	..	..
circular c.s.	**Vice-Admiral Popoff**, B.S.	(iron & wood)	3590	120	0	120	0	16	16 tower	9	13	5	6	3066	2 12-in. 40-ton B.L.R., 6 l. .	..	1875	..	6·00	250	..
c.s., t.	**Veshtchun** .	.(iron)	1448	200	0	45	11	5 1-in. plates	11 1-in. plates	39	11	6	1	529	2 9-in. 15-ton B.L.R. . .	..	1864	..	6·00	..	..
a.c	**Vladimir Monomach**	(steel, iron & wood)	5796	296	6	52	0	6 comp.	unarmoured	..	24	11	2	7000	4 8-in. 9-ton B.L.R., 12 6-in 4-ton do., 4 M., 4 l.	2 f. tu. or l.car	1882	..	15·40	400	..

‡ These ships are now employed for harbour service.

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RUSSIA.—Unarmoured Ships.

(Bal., Baltic Fleet; B.S., Black Sea Fleet; Sib., Siberian Squadron.)

corv., corvette; *cr.*, cruiser; *d.v.*, despatch vessel; *g.v.*, gun-vessel; *to.cr.*, torpedo cruiser; *sl.*, sloop; P, deck protected throughout; f. tu., l. car., fixed tube or launching carriage for Fish torpedoes.

On the Russian List are the names of a large number of vessels which cannot be classified on the principles adopted in the British Navy. Many, though used for practically civil purposes, would be available for service of some kind in war. In the following Table steamers, with guns, of over 300 tons are included, and are designated despatch vessels (*d.v.*), or gun-vessels (*g.v.*).

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Discharges					
		tons.	ft. in	ft. in.		ft. in.						£	knots.	tons.	knots.
sl.	**Abrek**, Sib.	1069	193 6	29 6	wood	13 1	1	1109	3 6-in. B.L.R., 1 M., 2 l.	..	1860	..	..	..	..
cr. P.	**Admiral Korniloff**, Bal. (2½ steel deck).	5000	350 0	48 6	steel & wood sheathed	23 0	2	8260	14 16-c.m. B.L.R., 6 Q.F., 10 M.	6 f. tu. or l.car	1887	..	19·00	..	..
corv.	**Afrika**, Bal.	2852	285 5	39 4	iron	17 1	1	1350	5 6-in. 4-ton B.L.R., 4 M., 7 l.	..	1877	..	13·00	..	..
cr.	**Aleüt**, Sib.	810	170 0	31 0	steel	10 0	1	1300	.. ..	..	1886	..	..	..	..
„	**Asia**, Bal.	2483	269 0	36 0	iron	16 5	1	1100	3 6-in. 4-ton B.L.R., 6 M., 5 l.	..	1878	..	12·00	..	..
„	**Askold**, Bal.	2245	216 6	39 4	wood	20 4	1	910	8 6-in. 4-ton B.L.R., 5 M., 5 l.	..	1863	..	9·00	..	..
„	**Bayan**, Bal.	1998	206 9	36 0	„	18 4	1	978	4 6-in. 4-ton B.L.R., 2 M., 5 l.	..	1857	..	10·00	..	..
g.v.	**Bobr**, Sib.	950	187 0	35 2	steel	10 10	2	1000	1 24-c.m. 15-ton B.L.R., 1 15-c.m. 4-ton do., 2 M., 6 l.	..	1884	43,000	14·00	..	..
corv.	**Bogatyr**, Bal.	2204	213 3	39 4	wood	19 4	1	991	8 6-in. 4-ton B.L.R., 1 M., 4 l.	..	1860	..	9·00	..	..
g.v.	**Bombory**, B.S.	760	160 9	26 3	„	14 5	1	230	2 small guns	..	1852	..	..	..	..
to.cr.	**Captain Sacken**, B.S.	600	230 0	24 0	steel	8 10	2	3500	7 3 pr. Q.F., 7 M.	..	1888	..	20·00	..	..
g.v.	**Choonomoretz**, B.S.	1200	210 0	35 0	..	10 0	1	2000	2 8-in. B.L.R., 1 6-in. do., 2 Q.F., 4 M.	2 f. tu. or l.car	1889	..	..	..	..
g.v.	**Coreetz**, Sib.	1200	210 0	35 0	..	10 0	2	2000	2 8-in. B.L.R., 1 6-in. do., 2 Q.F., 4 M.	2 f. tu. or l.car	1886	..	..	..	..
corv.	**Djigit**, Bal.	1456	206 9	32 10	iron & wood	16 1	1	1383	3 6-in. 4-ton B.L.R., 4 M., 4 l.	..	1876	..	12·50	..	..
g.v.	**Don**, B.S.	354	131 3	26 0	steel & wood sheathed	10 2	1	80 (nom.)	2 small guns	..	1856	..	..	..	..
„	**Donetz**, B.S.	1200	210 0	35 0	..	10 0	1	2000	2 8-in. B.L.R., 1 6-in. do., 2 Q.F., 4 M.	2 f. tu. or l.car	1887	..	..	..	..
„	**Gonez**, B.S. (Torpedo School)	745	173 10	26 0	iron	12 5	1	160 (nom.)	2 small guns	..	..	..	..	..	..

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to.cr.	**Ilyn**, Bal. . . .	600	230 0	24 0	steel	8	10	2	3500	7 3-pr. Q.F., 6 M.	8 f. tu. or l.car	1887	..	20·10	97	..
g.v.	**Ingul**, B.S. . . .	745	173 10	32 10	iron	12	5	1	469	2 guns	..	1872	..	..	..	..
d.v.	**Japonec**, Sib. transport .	1472	200 2	36 0	wood	12	8	1	300 (nom.)	.. ..	..	1858	..	6·00	..	..
corv.	**Jemtchug**, Bal. . .	1781	239 6	29 6	iron	17	4	1	1438	3 6-in. 4-ton B L.R., 4 M., 4 l. . .	2 f. tu. or l.car	1861	..	..	..	..
g.v.	**Jermak**, Sib. . . .	706	154 3	26 3	iron	11	2	1	125	2 guns	..	1870	..	..	..	..
„	**Kasbeck**, B.S. . .	692	167 4	26 3	„	11	2	1	280	2 small guns	..	1854	..	..	..	..
„	**Kelasurz**, B.S. . .	307	121 4	19 7	wood	10	5	1	246	4 small guns	..	1859	..	..	..	..
corv.	**Kreyzer**, Bal. . .	1542	206 9	32 10	iron & wood	16	1	1	1205	3 6-in. 4-ton B.L.R., 1 M., 4 l. . .	..	1875	..	13·00	..	..
g.v.	**Kubanetz**, B.S. . .	1200	210 0	35 0	..	10	0	1	2000	3 9-in. 12 ton B.L.R., 1 6-in. do., 2 Q.F., 4 M.	3 f. tu. or l.car	1888	..	..	..	..
„	**Mandjur**, Bal. . .	1200	210 0	35 0	..	10	0	2	2000	2 8-in. B.L.R., 1 6-in. do., 2 Q.F., 4 M. .	2 f. tu. or l.car	1886	..	13·00	..	..
g.v.	**Morz**, Sib. . . .	456	147 7	22 11	wood	8	3	1	150	7 guns	..	1860	..	..	..	..
corv.	**Nayezdnik**, Bal. . .	1334	206 9	32 10	composite	14	9	1	1719	3 6-in. 4-ton B.L.R., 5 M., 4 l. . .	..	1878	..	13·00	..	..
g.v.	**Nerpa**, Sib . . .	379	124 7	22 11	wood	7	10	1	60 (nom.)	5 guns	..	1860	..	..	..	..
corv.	**Oprichnik**, Bal. . .	1426	206 9	32 10	composite	16	0	1	1685	4 6-in. 4-ton B.L.R., 6 M., 2 l. . .	..	1880	..	13·00	..	..
cr.	**Pamyat Merkuriya**, B.S.	3050	292 0	39 4	iron & steel	19	7	1	800	4 18-ton B.L.R., 4 4-in. do. . . .	2 f. tu. or l.car.	1880	..	14·00	..	..
d.v.	**Penderaklia**, B.S. . .	1052	190 3	29 6	iron	12	8	1	568	3 guns	..	1877	..	..	..	..
g.v.	**Pitsunda**, B.S. . .	335	137 11	19 7	wood	9	7	1	572	3 small guns	..	1857	..	..	..	..
sl.	**Plastun**, Bal. . .	1255	206 9	32 10	composite	14	1	1	1543	3 6-in. 4-ton B.L.R., 4 M., 5 l. . .	..	1879	..	12·00	..	..
g.v.	**Prut**, B.S. . . .	339	154 3	23 0	iron	7	3	1	327	2 guns	..	1849	..	..	..	..
„	**Psezuappé**, B.S. . .	335	127 11	19 7	„	10	5	1	216	4 small guns	..	1857	..	..	..	..
corv.	**Razboynik**, Bal. . .	1329	206 9	32 10	iron & wood	14	9	1	1786	3 6-in. 4-ton B.L.R., 5 M., 4 l. . .	..	1878	125,000	12·00	..	..
cr. P.	**Rynda**, Bal. (1½ inch steel deck.)	2950	265 9	45 11	steel & wood sheathed.	16	1	2	3600	10 6-in. 4-ton B.L.R., 6 M., 4 l. . .	2 f. tu. or l.car	1885	..	*13·00	710	2400
g.v.	**Salgir**, B.S. . . .	360	131 3	23 0	wood	10	5	1	107	.. ..	..	1857	..	..	..	..
„	**Sivootch**, Sib. . . .	950	187 0	33 2	steel	10	10	2	1000	1 24-c.m. 15-ton B.L.R., 1 15-c.m. 4-ton do., 2 M., 6 l.	..	1884	43,000	14·00	..	..
corv.	**Skobeleff**, Bal. . .	2397	216 6	39 4	wood	19	0	1	1042	8 6-in. 4-ton B.L.R., 4 M., 4 l. . .	..	1862	..	9·00	..	..
g.v.	**Sobol**, Sib. . . .	456	147 7	22 11	„	8	3	1	150	12 6-in. & 2 light guns . . .	..	1863	..	..	..	..

* The actual speed of this vessel has not exceeded 13 knots.

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RUSSIA.—Unarmoured Ships—*continued.*

(Bal., Baltic Fleet; B.S., Black Sea Fleet; Sib., Siberian Squadron.)

corv., corvette; *c.r.*, cruiser; *d.v.*, despatch vessel; *g.v.*, gun-vessel; *sl.*, sloop; *t. b. c.*, torpedo boat-catcher; P., deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
sl.	**Sokol**, B.S.	1057	160 9	32 10	wood	15 5	1	346	1 6-in. 4-ton B.L.R., 1 M., 8 l.	..	1859	..	..	..	..
g.v.	**Souk-Su**, B.S.	307	121 4	19 8	„	10 5	1	317	3 guns	..	1859	..	..	..	..
corv.	**Strjelok**, Bal.	1343	206 9	32 10	composite	14 2	1	1528	3 6-in. 4-ton B.L.R., 4 M., 4 l.	..	1880	..	13·00	..	..
fr.cr.	**Svjetlana**, Bal.	3200	223 2	49 3	wood	22 4	1	1113	6 8-in. 9 ton B.L.R., 6 6-in. 4-ton do., 7 M., 5 l.	..	1858	..	10·00	..	..
g.v.	**Tamanj**, B.S.	551	173 10	25 11	iron	9 7	1	745	2 guns	..	1849	..	..	..	..
„	**Teretz**, B.S.	1200	210 0	35 0	..	10 0	..	2000	3 9-in. 12-ton B.L.R., 1 6-in. do., 2 Q.F., 4 M.	2 f. tu. or l.car	1888	..	..	..	..
tr.cr.	New Torpedo Cruiser (Bldg. at the Schichau Works).	400	190 4	24 4	steel	..	2	..	..	..	Bldg.	31,500	21·0	..	..
„	**Tunguz**, Sib.	706	154 3	26 3	iron	11 2	1	130	4 guns	..	1870	..	..	..	..
„	**Turok**, B.S.	537	134 6	24 11	wood	11 2	1	422	2 guns	..	1846	..	..	..	..
„	**Uraletz**, B.S.	1200	210 0	35 0	..	10 0	..	2000	3 9-in. 12-ton B.L.R., 1 6-in. do., 2 Q.F., 4 M.	3 f. tu. or l.car	1888	..	..	..	..
cr. P.	**Vitiaz**, Bal. (1½ steel dk.).	2950	265 9	45 11	steel & wood sheathed.	16 1	2	3000	8 6-in. 4 ton B.L.R., 6 M., 4 l.	2 f. tu. or l.car	1884	125,000	*15·00	710	2400
sl.	**Vjestnik**, Bal.	1255	206 9	32 10	iron & wood sheathed.	14 2	1	1268	3 6-in. 4 ton B.L.R., 4 M., 4 l.	..	1879	..	12·00	..	..
corv.	**Voyin**, B.S.	1652	183 9	39 4	wood	17 4	1	875	1 8-in. B.L.R., 5 6-in. do., 3 M., 4 l.	..	1858	..	..	..	..
sl.	**Zabiyaka**, Bal.	1234	219 10	29 6	iron	14 9	1	1470	2 6-in. 4-ton B.L.R., 4 M., 5 l.	..	1878	..	14·00	..	..
g.v.	**Zaporitz**, B.S.	1200	210 0	35 0	..	10 0	2	1500	3 9-in. 12 ton B.L.R., 11 6-in. do., 2 Q.F., 4 M.	2 f. tu. or l.car	1887	..	..	..	..

* The actual speed of this vessel has not exceeded 13 knots.

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Besides the ships and vessels given in the alphabetical list there are besides a large number of small steamers, two corvettes, Varyag and Vevoda; one cruiser, Europa; two gun-vessels, Gaidamak and Izoovod, and two gunboats, Kartesh and Otliv, are used for harbour service only.

Gunboats, Staunch class (*Baltic Fleet*).—Boorya, Bouroun, Dojd, Grad, Groza, Meena, Snieg, Tutcha, Vikhr, Yersh (258 to 402 tons, 195 to 472 I.HP.).

Gunboats (*Baltic Fleet*).—Korsun, 191 tons, and Shtcheet, 240 tons. Also two building. Seven "steamers" building.

Steamers (*Gun vessels, Despatch vessels, &c.*) (*Black Sea Fleet*).—Abin, Ablanova, Batjuska, Bogot, Boltun, Bratec, Brestovitz, Matuska, Redoot-kali, Rodeemai, Sestrica, Taman, Tuabse (90 to 298 tons).

Steamer (*Siberian Squadron*).—Amur (190 tons).

Also yachts, training ships, paddle steamers, and the Caspian and Lake Aral Flotillas of small vessels. Among the yachts is the circular ship Opuit, formerly the Livadia, now fitted for transport work.

Torpedo boats (*First Class*).—Four over 130 feet long, 100 to 134 tons displacement, a speed of 20 knots, armed with two machine guns and two to four launching tubes. Twenty-one of 100 to 130 feet long, 40 to 90 tons displacement, and speed of 17 to 22 knots; armed with two to four machine guns and two bow tubes.

Second Class.—Seventy of from 60 to 80 feet long, 24 tons displacement, and 17 knots speed.

At the Schichau Works, a torpedo boat 152 ft. 6 in. long by 16 ft. 9 in., speed 26½ knots, is being built at a cost of £15,200.

At Crichton's Works, Alio, Frisland, two torpedo boats 152 ft. 3 in. long, 16 ft. 3 in. broad, and speed 22 knots, at a cost for the two of £34,580.

NOTE.—All the torpedo boats in Russia have names, but, as done for other countries, the names are not given here.

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Volunteer Fleet.

Class.	NAME.	Material built of.	Where built.	When built.	Length.	Breadth.	Depth of Water.	Displacement.	Horse-power of Engines.	No. of Screws.	
					ft. in.	ft. in.	ft. in.	tons.			
Auxiliary Cruiser	Czar	steel	Newcastle	1883	319 0	37 0	23 6	2240	350 nom.	1	These vessels, which belong to the Black Sea Co. and are subsidised, have a speed of 16 knots, carry five to ten 12-c.m. B.L. guns, and several machine-guns.
,,	Czarevna	,,	,,	1883	319 0	37 0	23 6	2240	350 nom.	1	
,,	Czaritza	,,	,,	1883	319 0	37 0	23 6	2240	350 nom.	1	
Cruiser	Kostroma	iron	Glasgow	1873	372 0	36 0	..	3030	—	—	
,,	Moskva (was Kinfauns Castle)	,,	,,	1879	360 0	43 0	..	3050	2730	1	
,,	Nijni Novgorod (was Saxonia)	,,	Greenock	1857	321 0	40 0	..	2670	300 nom.	1	
,,	St. Petersburg (was Thuringia)	,,	,,	1870	340 0	41 0	..	3050	2600	1	
,,	Russia (was Holsatia)	,,	,,	1868	341 0	40 0	21 0	3100	2200	1	
,,	Vladivostock	,,	Renfrew	1880	324 0	29 0	..	1200	..	1	
,,	Yaroslav	,,	La Seyne	1880	295 0	41 0	..	2350	3000	1	
,,	Argonaut	..	..	..	..	..	..	..	..	..	These vessels belong to the Black Sea Co.
,,	Constantine	..	..	..	..	..	..	..	..	..	

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SARAWAK.

Gunboat.—Aline: length, 242 ft. 6 in.; beam, 21 ft. 3 in.; tonnage, 175; 35 nom. H.P.; 2 guns; launched 1875. Lorna Doone; length, 103 ft. 4 in.; beam, 17 ft. 2 in.; tonnage, 118; 40 nom. H.P.; 2 guns; launched 1881.

Paddle steamer, Aden. Three armed launches (50 to 100 tons).

SIAM.—Unarmoured Ships.

Two corvettes (1000 tons, 8 guns); three gun-vessels; two gunboats; yachts, and small craft.

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SPAIN.—Armoured Ships.

a.g.b., armoured gunboat; *b.*, barbette ship; *br.*, broadside ship; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
b.	**Pelayo** (completing in France) (steel)	9900	330 0	66 0	17¾	19¼ barbettes	..	24 11	2	8000	2 32-c.m. 48-ton B.L.R., 2 28-c.m. 38-ton B.L.R., 1 16-c.m. do., 12 12-c.m. do., 14 M.	7 f. tu. or l.car	1887	..	16·00	700	..
a.g.b.	**Duque de Tetuan** (Harbour Service) (iron)	703	141 0	31 2	4	4	9	6 10	2	190	1 16-c.m. (Parrot), 4 bronze smoothbores.	..	1874	..	..	23	..
br.	**Numancia** (iron)	7305	314 10	55 9	5½	5	12	25 3	1	3708	8 10-in. M.L.R. (Armstrong), 7 8-in. do., 2 M., 8 l.	..	1863	315,600	8·00	740	2450
c.s., t.	**Puig-cerda** (Harbour Service) (iron Monitor)	553	127 11	29 6	4	4	9	6 7	2	328	2 16-c.m. bronze smoothbores, 1 16-c.m. B.L.R. (Palliser).	..	1874	..	8·00	23	..
br.	**Sagunto** (Harbour Service) (wood)	7352	292 0	55 10	6	6	24	30 1	1	3700	8 9-in. 13-ton M.L.R. (Armstrong), 3 18-c.m. (Palliser), 2 M., 8 l.	..	1869	..	8·00	900	..
„	**Vitoria** . (iron)	7250	318 3	55 10	5½	5	12	25 3	1	4500	8 9-in. 13-ton M.L.R. (Armstrong), 3 8-in. do., 2 M., 6 l.	2 f. tu. or l.car	1865	..	11·00	900	..
„	**Zaragoza** . (wood).	5620	278 10	55 10	5	5	26	24 7	1	3000	4 9-in. 13-ton M.L.R. (Armstrong), 3 18-c.m. (Palliser), 8 16-c.m. do., 2 M., 7 l.	..	1867	..	8·00	700	..
a.c.	Six belted cruisers .	7000	360 0	65 0	..	..	..	..	2	15,000	.. ..	..	..	..	19·50	..	..

NOTE.—The six belted cruisers of 7000 tons given in the list are being built; three of them in the Royal Dockyards, and three by contract at Bilbao.

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SPAIN.—Unarmoured Ships.

corv., corvette; *cr.*, cruiser; *d.v.*, despatch-vessel; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; *to.g.b.*, torpedo gun-boat; P, deck protected throughout; *pp.*, partial deck protected; f. tu., l. car., fixed tube or launching carriage for Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
d.v.	**Africa**	629	157 5	23 3	wood	15 3	1	280	2 12-c.m. bronze smooth-bores . .	..	1862	..	7·00	120	..
cr.	**Alfonso XII.** . . .	3090	278 10	42 7	steel	16 5	1	4800	8 16-c.m. B.L.R. (Hontoria), 4 9-c.m. do., 2 M., 2 l.	6 f. tu. or l.car	1887	..	17·50	600	..
cr. P.	**Alfonso XIII.** . . .	5000	318 6	50 6	steel	20 0	2	11,000	4 24-c.m. B.L.R., 6 12-c.m. do., 8 Q.F., 8 M.	5 f. tu. or l.car	Bldg.	..	20·00	..	..
fr.cr.	**Almanza** (Surveying ship) .	3960	275 7	49 3	wood	20 11	1	600 (nom.)	22 16-c.m. M.L.R. (Palliser), 2 M., 6 l. .	..	1864	..	7·00	650	..
g.v.	**Animosa** (for Colonial Guard ship)	510	150 11	26 3	iron	7 7	1	100 (nom.)	1 16-c.m. 6-ton M.L.R. (Palliser), 1 12-c.m. bronze smooth-bore, 2 l.	..	1860	..	8·00	..	..
cr.	**Aragon**	3342	246 0	45 11	wood	20 11	1	4400	8 16-c.m. B.L.R. (Hontoria), 2 8·7-c.m. do. (Krupp), 4 l., 2 M.	..	1879	..	14·00	470	..
g.v.	**Bazan**	757	164 0	24 7	iron	10 10	2	739	1 13-c.m. M.L.R. (Parrot), 1 12-c.m. bronze smooth-bore.	..	1873	..	10·00	..	..
fr.cr.	**Blanca** (for Colonial Guard ship)	2452	209 11	42 7	wood	18 4	1	360 (nom.)	12 20-c.m. smooth-bores, 4 16-c.m. do., 4 l.	..	1859	..	8·00	300	..
g.v.	**Caridad**	370	147 7	22 7	wood	10 5	1	80 (nom.)	2 16-c.m. bronze smooth-bores . .	..	1860	..	6·50	80	..
fr.cr.	**Cármen** (for Colonial Guard ship)	3116	242 9	45 11	wood	19 7	1	600 (nom.)	16 20-c.m. smooth-bores, 4 16-c.m. do., 4 l.	..	1861	..	8·00	460	..
cr.	**Castilla**	3342	246 0	45 11	wood	20 11	1	4400	8 15-c.m. B.L.R. (Krupp), 4 9-c.m. do. (Hontoria), 2 M., 2 l.	..	1881	..	14·00	470	..
g.v.	**Céres**	415	144 4	22 7	wood	8 6	1	80 (nom.)	2 16-c.m. smooth-bores . . .	..	1860	..	6·00	80	..
„	**Concha**	524	157 5	25 7	iron	8 7	2	600	3 12-c.m. B.L.R. (Hontoria), 2 M. . .	2 f. tu. or l.car	1885	..	11·50	80	..
fr.cr.	**Concepcion** (for Colonial Guard ship)	3210	229 7	45 11	wood	20 1	1	2100	5 16-c.m. M.L.R., 16 20-c.m. smooth-bores, 4 l.	..	1860	..	8·00	360	..

SPAIN.—Armoured Ships.

a.g.b., armoured gunboat; *b.*, barbette ship; *br.*, broadside ship; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
b.	**Pelayo** (completing in France) (steel)	9900	330 0	66 0	17¾	19¼ barbettes	..	24 11	2	8000	2 32-c.m. 48-ton B.L.R., 2 28-c.m. 38-ton B.L.R., 1 16-c.m. do., 12 12-c.m. do., 14 M.	7 f. tu. or l.car	1887	..	16·00	700	..
a.g.b.	**Duque de Tetuan** (Harbour Service) (iron)	703	141 0	31 2	4	4	9	6 10	2	190	1 16-c.m. (Parrot), 4 bronze smooth-bores.	..	1874	..	..	23	..
br.	**Numancia** (iron)	7305	314 10	55 9	5½	5	12	25 3	1	3708	8 10-in. M.L.R. (Armstrong), 7 8-in. do., 2 M., 8 l.	..	1863	315,600	8·00	740	2450
c.s., t.	**Puig-cerda** (Harbour Service) (iron Monitor)	553	127 11	29 6	4	4	9	6 7	2	328	2 16-c.m. bronze smoothbores, 1 16-c.m. B.L.R. (Palliser).	..	1874	..	8·00	23	..
br.	**Sagunto** (Harbour Service) (wood)	7352	292 0	55 10	6	6	24	30 1	1	3700	8 9-in. 13-ton M.L.R. (Armstrong), 3 18-c.m. (Palliser), 2 M., 8 l.	..	1869	..	8·00	900	..
„	**Vitoria** . (iron)	7250	318 3	55 10	5½	5	12	25 3	1	4500	8 9-in. 13-ton M.L.R. (Armstrong), 3 8-in. do., 2 M., 6 l.	2 f. tu. or l.car	1865	..	11·00	900	..
„	**Zaragoza** . (wood).	5620	278 10	55 10	5	5	26	24 7	1	3000	4 9-in. 13-ton M.L.R. (Armstrong), 3 18-c.m. (Palliser), 8 16-c.m. do., 2 M., 7 l.	..	1867	..	8·00	700	..
a.c.	Six belted cruisers .	7000	360 0	65 0	..	..	..	..	2	15,000	.. ..	..	..	..	19·50	..	..

NOTE.—The six belted cruisers of 7000 tons given in the list are being built; three of them in the Royal Dockyards, and three by contract at Bilbao.

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SPAIN.—Unarmoured Ships.

corv., corvette; *cr.*, cruiser; *d.v.*, despatch-vessel; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; *to.g.b.*, torpedo gun-boat; P, deck protected throughout; *pp.*, partial deck protected; f. tu., l. car., fixed tube or launching carriage for Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
d.v.	**Africa**	629	157 5	23 3	wood	15 3	1	280	2 12-c.m. bronze smooth-bores	..	1862	..	7·00	120	..
cr.	**Alfonso XII.**	3090	278 10	42 7	steel	16 5	1	4800	8 16-c.m. B.L.R. (Hontoria), 4 9-c.m. do., 2 M., 2 l.	6 f. tu. or l.car	1887	..	17·50	600	..
cr. P.	**Alfonso XIII.**	5000	318 6	50 6	steel	20 0	2	11,000	4 24-c.m. B.L.R., 6 12-c.m. do., 8 Q.F., 8 M.	5 f. tu. or l.car	Bldg.	..	20·00	..	..
fr.cr.	**Almanza** (Surveying ship)	3960	275 7	49 3	wood	20 11	1	600 (nom.)	22 16-c.m. M.L.R. (Palliser), 2 M., 6 l.	..	1864	..	7·00	650	..
g.v.	**Animosa** (for Colonial Guard ship)	510	150 11	26 3	iron	7 7	1	100 (nom.)	1 16-c.m. 6-ton M.L.R. (Palliser), 1 12-c.m. bronze smooth-bore, 2 l.	..	1860	..	8·00	..	..
cr.	**Aragon**	3342	246 0	45 11	wood	20 11	1	4400	8 16-c.m. B.L.R. (Hontoria), 2 8·7-c.m. do. (Krupp), 4 l., 2 M.	..	1879	..	14·00	470	..
g.v.	**Bazan**	757	164 0	24 7	iron	10 10	2	739	1 13-c.m. M.L.R. (Parrot), 1 12-c.m. bronze smooth-bore.	..	1873	..	10·00	..	..
fr.cr.	**Blanca** (for Colonial Guard ship)	2452	209 11	42 7	wood	18 4	1	360 (nom.)	12 20-c.m. smooth-bores, 4 16-c.m. do., 4 l.	..	1859	..	8·00	300	..
g.v.	**Caridad**	370	147 7	22 7	wood	10 5	1	80 (nom.)	2 16-c.m. bronze smooth-bores	..	1860	..	6·50	80	..
fr.cr.	**Cármen** (for Colonial Guard ship)	3116	242 9	45 11	wood	19 7	1	600 (nom.)	16 20-c.m. smooth-bores, 4 16-c.m. do., 4 l.	..	1861	..	8·00	460	..
cr.	**Castilla**	3342	246 0	45 11	wood	20 11	1	4400	8 15-c.m. B.L.R. (Krupp), 4 9-c.m. do. (Hontoria), 2 M., 2 l.	..	1881	..	14·00	470	..
g.v.	**Céres**	415	144 4	22 7	wood	8 6	1	80 (nom.)	2 16-c.m. smooth-bores	..	1860	..	6·00	80	..
„	**Concha**	524	157 5	25 7	iron	8 7	2	600	3 12-c.m. B.L.R. (Hontoria), 2 M.	2 f. tu. or l.car	1885	..	11·50	80	..
fr.cr.	**Concepcion** (for Colonial Guard ship)	3210	229 7	45 11	wood	20 1	1	2100	5 16-c.m. M.L.R., 16 20-c.m. smooth-bores, 4 l.	..	1860	..	8·00	360	..

SPAIN.—Unarmoured Ships—*continued.*

corv., corvette; *cr.*, cruiser; *d.v.*, despatch-vessel; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; *to.g.b.*, torpedo gun-boat; P, deck protected throughout; *pp.*, partial deck protected; f. tu., l. car., fixed tube or launching carriage for Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
cr.	Conde de Venadito . .	1130	210 0	32 0	iron	12 6	1	1600	2 4¾-in. B.L.R., 2 3-½in. do., 5 M. . .	2 f. tu. or l.car	1888	..	14·00	220	..
cr.	Cristobel Colon . .	1130	210 0	32 0	iron	12 6	1	1600	3 6-in. B.L.R., 2 3½-in. do., 5 M. . .	2 f. tu. or l.car	1887	..	14·00	220	..
„	Don Antonio Ulloa . .	1130	210 0	32 0	iron	12 6	1	1600	3 6-in. B.L.R., 2 3½-in. do., 5 M. . .	2 f. tu. or l.car	1887	..	14·00	220	..
„	Don Juan de Austria .	1130	210 0	32 0	iron	12 6	1	1600	3 6-in. B.L.R., 2 3½-in. do., 5 M. . .	2 f. tu. or l.car	1887	..	14·00	..	..
to.g.b.	Destructor . . .	458	192 6	25 0	steel	mean dt. 7 0	2	3800	1 9-c.m. B.L.R., 4 6-pr. Q.F., 4 M. . .	3 f. tu. or l.car	1887	..	22·56	..	5500
g.v.	El Cano	524	157 5	25 7	iron	8 6	2	600	3 12-c.m. B.L.R. (Hontoria), 2 M. . .	..	1885	..	11·50	80	..
cr.	Ensenada	1030	185 0	30 0	steel	11 6	2	1600	6 12-c.m. B.L.R. (Hontoria), 4 M. . .	3 f. tu. or l.car	Bldg.	..	15·00	..	..
d.v.	Fernando el Catolico .	500	157 5	25 7	iron	8 5	2	550	1 16-c.m. M.L.R. (Palliser), 2 12-c.m. smooth-bores, 1 M.	..	1875	..	10·00	20	..
g.v.	General Lezo . . .	524	157 5	25 7	iron	8 6	2	600	3 12-c.m. R.L.R. (Hontoria), 2 M. . .	1 f. tu. or l.car	1885	..	11·00	80	..
fr.cr.	Gerona	3980	265 9	49 3	wood	20 8	1	600 (nom.)	21 smooth-bores, 2 l.	..	1864	..	9·00	675	..
sl.	Infanta Isabel . . .	1130	210 11	32 2	iron	12 5	2	1500	5 12-c.m. B.L.R. (Hontoria), 5 M., 2 l. .	..	1885	..	14·00	220	..

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„	Isabel II. . . .	1130	210	11	32	2	iron	12	5	2	1500	5 12-c.m. B.L.R. (Hontoria), 5 M., 2 l. .	..	1886	..	14·00	220	..
cr.	Isla de Cuba *pp.* . .	1030	185	0	30	0	steel	11	6	2	2200	6 4-$\frac{2}{3}$in. B.L.R., 4 6-pdr. Q.F. . . .	3 f. tu. or l.car	1887	..	16·00	160	..
cr.	Isla de Luzon *pp.* . .	1030	185	0	30	0	steel	11	6	2	2200	6 4$\frac{2}{3}$-in. B.L.R., 4 6-pdr. Q.F. . . .	3 f. tu. or l.car	1887	..	16·00	160	..
„	Jorge Juan . . .	935	203	5	29	6	wood	12	2	1	1100	3 16-c.m. 6-ton M.L.R. (Palliser), 2 M., 2 l.	..	1876	..	13·00	130	..
cr. P.	Lepanto	5000	318	6	50	6	steel	20	0	2	11,000	4 24-c.m. B.L.R., 6 12-c.m. do., 8 Q.F., 8 M.	5 f. tu. or l.car	Bldg.	..	20·00	1100	..
g.v.	Ligera	445	147	7	23	7	wood	8	10	1	393	2 16-c.m. M.L.R., 1 12-c.m. smooth-bore, 1 l.	..	1864	..	7·00	180	..
„	Magellanes . . .	524	157	5	25	7	iron	8	6	2	600	3 12-c.m. B.L.R. (Hontoria), 2 M. . .	..	1885	..	11·00	80	..
d.v.	Marques del Duero . .	500	157	5	25	7	iron	8	5	2	550	1 16-c.m. M.L.R. (Palliser), 2 12-c.m. smooth-bores, 1 M.	..	1875	..	10·00	90	..
cr.	Navarra	3342	232	11	42	7	wood	20	4	1	4400	8 16-c.m. B.L.R. (Hontoria), 2 8·7-c.m. do. (Krupp), 2 M., 4 l.	..	1881	..	13·00	470	..
fr.cr.	Navas de Tolosa . .	4460	265	9	49	3	wood	22	4	1	600 (nom.)	22 16-c.m. M.L.R. (Palliser), 4 16-c.m. smooth-bores, 4 l.	..	1865	..	7·00	670	..
g.v.	Prosperidad . . .	420	141	0	22	7	wood	9	7	1	134	2 16-c.m. smooth-bores, 1 M., 1 l. . .	..	1865	..	6·00	80	..
cr.	Reina Christina . .	3090	278	10	42	7	steel	16	5	1	4800	8 16-c.m. B.L.R. (Hontoria), 4 9-c.m. do., 2 M., 2 l.	5 f. tu. or l.car	1886	..	17·50	600	..
„	Reina Mercedes . .	3090	278	10	42	7	steel	16	5	1	4860	8 16-c.m. B.L.R. (Hontoria), 4 9-c.m. do., 2 M., 2 l.	5 f. tu. or l.car	1887	..	17·50	600	..
„ P.	Reina Regente . . .	5000	318	6	50	6	steel	20	0	2	11,000	4 24-c.m. 21-ton B.L.R., 6 12·c.m.do., 8 Q.F., 8 M.	5 f. tu. or l.car	1887	..	20·70	1100	..
sl.	Sanchez Barcaistegui .	935	203	5	29	6	wood	12	2	1	1100	3 16-c.m. 6-ton M.L.R. (Palliser), 2 M., 2 l.	..	1876	..	13·00	130	..
d.v.	San Quentin . . .	1300	246	0	32	10	iron	11	6	1	1500	3 12-c.m. B.L.R. (Hontoria), 1 M., 2 l. .	..	1856	..	10·00	360	..
g.v.	Sirena	445	147	7	22	11	wood	9	6	1	227	1 16-c.m. M.L.R. (Palliser), 2 12-c.m. smooth-bores, 2 l.	..	1863	..	8·00	95	..
corv.	Tornado (Torpedo School ship)	2090	219	10	32	10	composite	14	5	1	328 (nom.)	2 16-c.m. M.R.L. (Palliser), 2 12-c.m. smooth-bores, 2 l.	..	1866	..	9·00	350	..
to.g.b.	Torpedo Gunboats (four vessels)	600	(Ordered to be built.)					..	..	..	..	.. .. ..	..	..	..	..	..	..
g.v.	Valiente	733	150	1	25	11	iron	7	10	1	380	1 16-c.m. M.R.L. (Palliser) 1 12-c.m. smooth-bore, 2 l.	..	1860	..	7·00	130	..
sl.	Velasco	1152	209	11	29	8	iron	12	5	1	1500	3 15-c.m. 4-ton B.R.L. (Armstrong), 1 M., 2 l.	..	1881	..	14·30	220	..

Besides the ships and vessels in the alphabetical list there are the paddle vessels, Ferrolano, Gaditano, Liniers, training ships and transports; also

Gunboats.—Alsedo, Cocodrillo, Cuba-Española, Eulalia, Paz, Pelicano, Pilar, Salamandra (216 to 245 tons, 199 to 240 indicated horse-power).

Small steamers, classed as third class gunboats, forty-three in number (33 to 179 tons).

Torpedo boats.—Two seagoing torpedo boats of the Ariète type, of 135 feet in length, 108 tons displacement and 26·11 knots speed; two torpedo boats of the Falke type, 108 tons displacement, 135 feet in length, and 23 knots; and eleven other first class boats.

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SWEDEN.—Armoured Ships.

a.g.b., armoured gunboat; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Turret.	Water-line.					Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
a.g.b.	**Berserk** . (iron)	452	131 3	29 6	14	2½	34	8 3	2	155	1 24-c.m. 15-ton B.L.R., 2 M. . .	..	1874	..	8·00	19	..
„	**Bjorn** . (iron)	457	131 3	26 3	14	2½	34	8 3	2	155	1 24-c.m. 15-ton B.L.R., 2 M. . .	..	1874	..	8·00	19	..
„	**Fenris** . (iron)	259	104 11	22 4	11	2	34	7 10	1	44	1 24-c.m. 15-ton B.L.R., 2 M. . .	..	1872	..	6·00	7	..
„	**Folke** . (iron)	460	131 3	26 3	14	2½	34	8 3	2	155	1 24-c.m. 15-ton B.L.R., 2 M. . .	..	1875	..	8·00	19	..
„	**Garmer** . (iron)	268	91 10	22 11	6	2	8	7 7	1	90	1 27-c.m. 24-ton B.L.R., 2 M. . .	..	1868	..	6·00	15	..
„	**Gerda** . (iron)	457	131 3	26 3	14	2½	34	8 3	2	133	1 24-c.m. 15-ton B.L.R., 2 M. . .	..	1873	..	8·00	19	..
t.	**Gota** . (steel)	3070	258 6	48 0	11½–9¾	11½–8	..	10 1	2	3100	2 10-in. 29-ton B.L.R., 4 6-in. do. .	1 f. tu. or l. car.	Bldng.	..	15·50	200	..
.,	**Hildur** . (iron)	457	131 3	26 3	14	2½	34	8 3	2	133	1 24-c.m. 15-ton B.L.R., 2 M. . .	..	1872	..	8·00	19	..
c.s., t.	**John Ericsson** (iron)	1500	200 2	45 11	11	4½	31½	11 6	1	380	2 24-c.m. 15-ton B.L.R., 2 M. . .	..	1865	..	6·00	112	..
„	**Loke** . (iron)	1600	205 3	45 11	18	4	40	11 10	1	430	2 24-c.m. 15-ton B.L.R., 3 M. . .	..	1871	..	7·00	112	..
a.g.b.	**Skold** . (iron)	247	104 11	22 4	9	1	34	8 3	1	17	1 24-c.m. 15-ton B.L.R., 2 M. . .	..	1869	..	4·00	5	..
„	**Sölve** . (iron)	454	131 3	29 6	14	2½	34	8 3	2	155	1 24-c.m. 15-ton B.L.R., 2 M. . .	..	1875	..	8·00	19	..
t.	**Svea** . (steel)	2900	249 4	49 3	11½	11½	11½	15 9	2	3100	2 10-in. 27-ton B.L.R. (Armstrong), 4 6-in. 4-ton do., 6 M.	6 f. tu. or l.car	1886	127,300	15·45	200	800 at 12 knots.
c.s., t.	**Thordon** . (iron)	1500	200 2	45 11	11	4½	26	11 6	1	380	2 24-c.m. 15-ton B.L.R., 2 M. . .	..	1866	..	6·00	112	..
„	**Tirfing** . (iron)	1500	200 2	45 11	11	4½	26	11 6	1	380	2 24-c.m. 15-ton B.L.R., 2 M. . .	..	1867	..	6·00	112	..
a.g.b.	**Ulf** . . (iron)	457	131 3	26 3	14	2½	34	8 3	2	155	1 24-c.m. 15-ton B.L.R., 2 M. . .	..	1873	18,000	8·00	20	..

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SWEDEN.—Unarmoured Ships.

corv., corvette; *fr. cr.*, frigate-built cruiser; *g.v.* gun-vessel; *tor. ship*, torpedo ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
corv.	**Balder**	1886	203 5	36 0	wood	18 4	1	1380	4 15-c.m. B.L.R. (Armstrong), 2 12-c.m. B.L.R., 6 M., 1 l.	..	1870	..	12·00	200	940
g.v.	**Blenda**	500	167 4	25 11	iron	9 2	2	590	1 27-c.m. 24-ton B.L.R. (Armstrong), 1 12-c.m. B.L.R., 2 M.	..	1875	..	12·00	98	..
„	**Disa**	500	167 4	25 11	„	9 2	2	590	1 27-c.m. 24-ton B.L.R. (Armstrong), 1 12-c.m. B.L.R., 2 M.	..	1877	..	12·00	98	..
tor. ship.	**Drott** (was Ran) (Torpedo vessel)	630	173 10	26 3	„	9 6	2	960	4 Engström, Q.F..	3 f. tu. or l.car	1877	..	13·00	100	1000
g.v.	**Edda**	640	180 5	27 3	„	9 6	2	960	1 27·4-c.m. 27-ton B.L.R., 1 15-c.m., do. 4 M.	..	1882	..	13·00	80	..
corv.	**Freja**	2000	216 6	39 4	steel&wood	18 9	1	1750	4 15-c.m. 4-ton B.L.R., 8 12-c.m. do., 8 M.	..	1885	..	12·00	180	..
g.v.	**Rota**	537	170 7	26 3	iron	9 2	2	780	1 27-c.m. 24-ton B.L.R., 1 12-c.m. do., 2 M.	..	1878	..	13·00	80	..
corv.	**Saga** (School Ship) . .	1535	200 2	32 10	wood	17 1	1	900	1 15-c.m. 5-ton B.L.R. (Armstrong), 6 12-c.m. B.L.R., 4 M., 2 l.	..	1878	..	11·00	170	..
g.v.	**Skaggald** . . .	537	170 7	26 3	iron	9 2	2	780	1 27-c.m. 24-ton B.L.R., 1 12-c.m. do., 2 M.	..	1879	..	13·00	80	..
„	**Skagul**	537	170 7	26 3	„	9 2	2	780	1 27-c.m. 24-ton B.L.R., 1 12-c.m. do., 2 M.	..	1878	..	13·00	80	..
„	**Skuld**	537	170 7	26 3	„	9 2	2	780	1 27-c.m. 24-ton B.L.R., 1 12-c.m. do., 2 M.	..	1880	..	13·00	80	..
„	**Urd**	537	170 7	26 3	„	9 2	2	780	1 27-c.m. 24-ton B.L.R., 1 12-c.m. do., 2 M.	..	1877	..	13·00	80	..
fr. cr.	**Vanadis**	2136	209 11	42 7	wood	20 1	1	1400	8 17-c.m. 5-ton B.L.R., 8 16-c.m. 3-ton shell guns, 4 M.	..	1862	..	11·00	235	..
g.v.	**Verdande**	537	170 7	26 3	iron	9 2	2	780	1 27-c.m. 24-ton B.L.R., 1 12-c.m. do., 2 M.		1879		13·00	80	

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Gunboats.—Alfhild, Aslog, Astrid, Gunhild, Hagl&nd, Ingegerd, Motala, Sigrid (180 to 200 tons, and about 130 indicated horse-power), each carrying 1 12-cm. B.L.R. and 2 M.

Torpedo boats.—First class: four of 65 tons and 19 knots speed, six other first-class boats of 40 tons displacement and 18 knots speed, one of 34 tons displacement, and 16 knots speed, and seven other boats of smaller size and less speed.

One first-class boat is building.

The Swedish navy has besides the Torpedo School vessel Ran, built of steel and of 175 tons displacement, 140 I.H.P. and 10 knots speed; training ships, transports, surveying vessels, and some steamers of old construction.

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TURKEY.—Armoured Ships.

a.g.b., armoured gunboat; *br.*, broadside ship; *c.b.*, central-battery ship; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Turret or Battery.	Belt.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.b.	**Assar-i-Schefket** .(iron)	2080	203 5	42 7	4½	6	9	16 5	2	1750	5 8-in. 7-ton M.L.R. (Armstrong), 2 l., 5 M.	..	1868	..	11·00	300	..
,,	**Assar-i-Tevfik** .(iron)	4687	272 4	52 6	6	8	9	24 11	1	3560	8 9-in. 12-ton M.L.R. (Armstrong), 5 l., 8 M.	..	1868	..	13·00	400	..
,,	**Avni-Illah** . . .(iron)	2400	226 4	36 0	5	6	10	16 5	1	2200	4 9-in. 13-ton M.L.R. (Armstrong), 1 12-c.m. K. B.L., 1 l., 6 M.	..	1869	..	12·00	220	..
br.	**Azazieh** . . .(iron)	6400	292 0	55 9	5	5½	9	25 7	1	3735	1 9-in. 12-ton M.L.R. (Armstrong), 17 8-in. 7-ton do., 8 M.	..	1864	..	13·00	750	..
c.b.	**Feth-i-Bulend** . .(iron)	2806	236 3	39 4	6	9	10	18 1	1	3250	4 9-in. 12-ton M.L.R. (Armstrong), 2 7-in. 6-ton do., 2 l., 6 M.	..	1869	..	13·00	300	..
a.g.b.	**Feth-el-Islam** . .(iron)	335	101 9	24 7	3	3	10	5 11	1	290	2 7-in. (Armstrong), 1 l. . . .	..	1864	..	8·00	20	..
c.b.	**Hamidieh** . . .(iron)	6700	292 0	55 9	5	9	18	24 10	1	6800	10 24-c.m. 13-ton B.L.R. (Krupp), 2 17-c.m. 6-ton do., 6 l., 2 M.	..	1885	..	13·00	600	..
a.g.b.	**Hisber** (was Nusritieh) (iron)	404	144 4	30 10	3	3	5½	5 7	1	400	2 15-c.m. B.L.R. (Krupp) . . .	..	1875	..	7·00	20	..
t.	**Hufzi-el-Rahman** .(iron)	2540	204 0	45 11	5	4½	10	14 5	1	200 nom.	2 9-in. 12-ton M.L.R. (Armstrong), 2 7-in. 6-ton do., 1 5-in. do., 6 M.	..	1868	..	12·00	200	..
c.b.	**Idjilalieh** . . .(iron)	2266	213 3	42 7	4·5	6	13	17 4	1	1800	2 9-in. 12½-ton M.L.R. (Armstrong), 3 7-in. 6-ton, 8 M.	..	1870	..	11·00	300	..
br.	**Mahmudieh** . .(iron)	6400	292 0	55 9	5	5½	9	25 7	1	3735	1 9-in. 12-ton M.L.R. (Armstrong), 17 8-in. 6-ton do., 8 M.	..	1864	..	12·00	750	..
a.g.b.	**Meindooyeh** (was Semendrieh) . . .(iron)	335	101 9	24 7	3	3	10	5 11	1	290	2 7-in. (Armstrong), 1 l. . . .	..	1864	..	8·00	20	..
c.b.	**Mesoodieh** . . .(iron) (Sister to the English ship Superb)	9120	331 5	59 0	10	12	10	25 11	1	7431	12 10-in. 18-ton M.L.R. (Armstrong), 3 7-in. 6-ton do., 2 M., 6 l.	..	1874	..	13·00	600	..
,,	**Muin-i-Zaffer** . .(iron)	2400	230 0	36 0	5	6	10	16 5	2	2200	4 9-in. 12-ton M.L.R. (Armstrong), 1 12-c.m. K., 1 l., 6 M.	..	1869	..	12·00	220	..
c.b.	**Mukadim-i-Hair** .(iron)	2806	236 3	39 4	6	9	10	18 1	1	3000	4 9-in. 12-ton M.L.R. (Armstrong), 2 7-in. 6-ton do., 2 l., 6 M.	..	1872	..	12·00	300	..
c.b.	**Nedjim-i-Schefket** .(iron)	2080	203 5	42 7	4½	6	9	16 5	2	1900	5 8-in. 7-ton M.L.R. (Armstrong), 2 l., 5 M.	..	1868	..	11·00	300	..
b.r.	**Orkanieh** . . .(iron)	6400	292 0	55 9	5	5½	9	25 7	1	3735	1 9-in. 12-ton M.L.R. (Armstrong), 17 8-in. 6-ton do., 8 M.	..	1865	..	12·00	750	..
,,	**Osmanieh** . . .(iron)	6400	292 0	55 9	5	5½	9	25 7	1	3735	1 9-in. 12-ton M.L.R. (Armstrong), 17	..	1864	..	12·00	750	..

fr.cr., frigate-built cruiser; *g.v.*, gun-vessel; *sl.*, sloop; *to.g.b.*, torpedo gunboat.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Nominal Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	**Beyruth**	609	173 6	26 7	..	12 10	1	160	1 6-in. 3-ton B.L.R., 1 4⅔-in. do., 6 40-pdr.	..	1863	..	10·00	120	..
sl.	**Brussa**	800	172 6	30 6	wood	15 2	1	150	2 6-in. B.L.R., 8 4⅔-in. do.	..	1859	..	11·00	120	..
„	**Edirneh** . . .	782	172 6	30 6	wood	14 2	1	150	2 6-in. 5-ton B.L.R., 10 4⅔-in. do.	..	1859	..	11·00	120	..
fr.cr.	**Ertogrul**	2344	250 0	49 10	wood	23 7	1	600	21 6-in. 3-ton B.L.R., 20 4⅔-in. do.	..	1863	..	10·00	350	..
gv.	**Iskenderieh** . . .	609	173 6	26 7	wood	12 10	1	160	1 6-in. 3-ton B.L.R., 1 4⅔-in. do., and 6 40-pdr.	..	1863	..	11·00	120	..
sl.	**Mansureh**	800	174 10	30 6	wood	15 2	1	150	2 6-in. B.L.R., 8 4⅔-in. do.	..	1863	..	11·00	120	..
„	**Mehemet Selim** . . .	1300	196 10	32 10	wood	16 6	1	450	21 6-in. 3-ton B.L.R.	..	1875	..	11·00	250	..
g.v.	**Mehrieh** . . .	609	173 6	26 7	wood	12 10	1	160	2 4⅔-in. B.L.R.	..	1863	..	10·00	120	..
fr.cr.	**Mookbir-i-Sooroor** (T. Sch.)	1477	209 11	38 0	..	17 5	1	450	22 guns . . .	..	1879	..	..	..	..
sl.	**Musafer**	800	174 10	30 6	wood	15 2	1	150	2 6-in. 5-ton B.L.R., 10 4⅔-in. do.	..	1863	..	12·00	150	..
„	**Sedul Bahr** . . .	609	173 6	26 7	wood	12 10	1	160	2 4⅔-in. B.L.R. . .	..	1859	..	10·00	120	..
fr.cr.	**Selimieh**	4717	279 10	59 0	wood	23 7	1	600	25 6-in. 3-ton B.L.R., 24 4⅔-in. do.	..	1865	..	10·00	350	..
sl.	**Sinope**	800	172 0	30 6	wood	15 0	1	150	1 6-in. 5-ton B.L.R., 8 4⅔-in. do.	..	1859	..	10·00	120	..
to. g. b.	Not named	900	230 0	31 0	steel	16 6	..	4500	2 10½-c.m. B.L.R. (Krupp), 6 8½-c.m. do.	4 f. tu. or l.car	Bldg.	..	19·00	..	..
„	Not named	260	200 0	20 3	steel	8 0	2	2700	1 4-in. B.L.R., 6 M.	..	Bldg.	..	21·00	..	..
g.v.	**Uthared**	609	173 6	26 7	wood	12 10	1	160	2 4⅔-in. B.L.R. . .	..	1863	..	10·00	120	..
„	**Zuhaf**	609	173 6	26 7	wood	12 10	1	160	2 4⅔-in. B.L.R. . .	..	1862	..	10·00	120	..
sl.	Not named	1960	226 0	37 0	composite	14 0	1	2500	2 6-in. 5-ton B.L.R., 4 4⅔-in. do.	..	Bldg.	..	14·00	..	..
„	Not named	1160	210 0	35 0	composite	14 0	1	1800	2 6-in. 5-ton B.L.R., 4 4⅔-in. do.	..	Bldg.	..	14·00	..	..

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27 *Despatch Vessels and Yachts.*—Ainaly-Kawak, (Paddle) Arcadia, Candia, Chania, Esser-i-Djidid, Esser-i-Neiseret, Faiz-i-Bahri, Fevaid, Iksan, (Paddle) Ismail, Izzedin, Moodar-i-Zaffer, Monassir Noodooscheh-i-Reisan, Peih-i-Tidjaret, Rethimo, Rhodos (Paddle), Sahir, Seyar, Seyar-i-Derja Soolhie, Stamboul, Stankio (Paddle), Sultanieh, Surreya, Syrat (Paddle), Thalia of 194 tons to 1512 tons displacement, and 50 H.P. to 800 H.P. About one-half of these vessels are built of wood.

4 *Gunboats.*—Akha, Frat, Shefket-Numa, and Shat of 200 tons displacement and 60 H.P., and about 10 knots speed.

Torpedo boats.—In addition to the two-torpedo gunboats given in the alphabetical list of unarmoured vessels, there are 19 first class torpedo boats built and building, 8 of 88 tons and of 20 to 22 knots speed, and the remaining eleven of 43 tons displacement and 20 knots speed.

There are also, in addition to the vessels named in the lists, screw and paddle transports and store ships, harbour ships and vessels, tugs, &c., &c.

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t., turret ship, *a. c.*, armoured cruizer; *c.s., t.*, coast-service turret ship; *to. ram*, torpedo ram; f. tu., or l. car., fixed tube, or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Mean Draught of Water.	Propeller.	Indicated Horse power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Turret or Battery.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.s., t.	**Ajax** (1 turret) (iron).	2100	226 4	43 7	5	11	..	13 9	1	840	2 15-in. 19-ton smooth-bores .	..	1864	125,000	6·00	160	..
to. ram	**Alarm** (iron) . .	720	172 6	29 3	4 (on traverse)	..	16	11 2	1	800	1 15-in. smooth-bore . .	..	1873	..	11·00	..	..
c.s., t.	**Amphitrite** (2 t.) . (iron)	3815	249 4	55 9	7	11½	..	14 3	2	1600	4 10½ 25-ton B.L.R., 2 Q.F., 4 M.	..	1885 (rebuilt)	..	12·00	300	1800
„	**Camanche** (1 t.) (iron)	1875	200 2	45 11	5	11	..	11 6	1	350	2 15-in. 19-ton smooth-bores .	..	1863	125,000	6·00	160	..
„	**Canonicus** (1 t.) (iron)	2100	226 4	43 7	5	11	..	13 9	1	320	2 15-in. 19-ton smooth-bores .	..	1864	125,000	6·00	160	..
„	**Catskill** (1 t.) (iron) .	1875	200 2	45 11	5	11	..	11 6	1	350	2 15-in. 19-ton smooth-bores .	..	1863	..	6·00	150	..
	Coast Defence . .	4000	250 0	59 0	16	16–14	..	14 6	2	5400	1 16-in. 115-ton B.L.R., 1 12-in. 48-ton do., 1 15-in. dynamite gun, 15 Q.F.	..	to be built	..	..	..	..
to. ram	**Intrepid** (iron) . .	1123	170 7	36 0	5	..	14	11 10	2	800	.. ..	..	1874	..	9·00	..	..
c.s., t.	**Jason** (1 t.) (iron) .	1875	200 2	45 11	5	11	..	11 6	1	350	2 15-in. 19-ton smooth-bores .	..	1864	..	6·00	150	..
„	**Lehigh** (1 t.) (iron) .	1875	200 2	45 11	5	11	..	11 6	1	350	2 15-in. 19-ton smooth-bores .	..	1864	..	6·00	150	..
„	**Mahopac** (1 t.) (iron)	2100	226 4	43 7	5	10	..	13 9	1	320	2 15-in. 19-ton smooth-bores .	..	1865	..	6·00	160	..
a. c., t.	**Maine** (2 t.) (steel)	6648	310 0	57 0	11	10½	2-in. st. dk.	21 6	2	9000	4 10-in. 26-ton B.L.R., 6 6-inch do., 8. Q.F., 17 M.	7 f. tu. orl.car.	Bldng.	517,600	17·00	850	7000
c. s., t.	**Manhattan** (1 t.) (iron)	2100	226 4	43 7	5	10	..	13 9	1	320	2 15-in. 19-ton smooth-bores .	..	1865	..	6·00	160	..
„	**Miantonomoh** (2 t.). (iron)	3815	249 4	55 9	7	11½	8	14 3	2	1600	4 10½-in. 25-ton B.L.R., 2 Q.F., 4 M.	..	1885 (rebuilt)	272,000	10·50	330	1800
„	**Monadnock** (2 t.) . (iron)	3815	249 4	55 9	7	11½	8	14 3	2	1600	4 10½-in. 25-ton B.L.R., 2 Q.F., 4 M.	..	1885 (rebuilt)	272,000	12·00	330	1800
„	**Montauk** (1 t.) (iron)	1875	200 2	45 11	5	11	..	11 6	1	350	2 15-in. 19-ton smooth-bores .	..	1864	..	5·50	160	..

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UNITED STATES.—Armoured Ships—(*continued.*)

t., turret ship; *a.c.*, armoured cruiser; *c.s., t.*, coast service turret ship; *to. ram*, torpedo ram; f. tu. or l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Turret or Battery.					Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.s., t.	**Nahant** (1 t.) (iron) .	1875	200 2	45 11	5	11	..	11 6	1	350	2 15-in. 19-ton smooth-bores .	..	1863	..	6·00	160	..
„	**Nantucket** (1 t.) (iron)	1875	200 2	45 11	5	11	..	11 6	1	350	2 15-in. 19-ton smooth-bores .	..	1863	..	5·60	160	..
„	**Passaic** (1 t.) (iron) .	1875	200 2	45 11	5	11	..	11 6	1	350	2 15-in. 19-ton smooth-bores .	..	1863	..	6·00	160	..
„	**Puritan** (2 t.) (iron) .	6060	280 0	60 0	12	11½	..	18 1	2	3700	4 10½-in. 25-ton B.L.R., 4 Q.F., 4 M.	..	1885 (rebuilt)	..	13·00	580	..
„	**Terror** (2 t.) (iron) .	3815	249 4	55 9	7	11½	8	14 3	2	1600	4 10½-in. 25-ton B.L.R., 2 Q.F., 4 M.	..	1885 (rebuilt)	206,800	12·00	330	1800
t.	**Texas** (2 t.) (steel) .	6300	290 0	64 0	12	12	3 in. steel dk.	22 6	2	8600	2 12-in. 46-ton B.L.R., 6 6-in. do., 8 Q.F., 4 M.	6 f. tu. or 1 car	Bldg.	495,000	17·00	850	7000
c.s., t.	**Wyandotte** (1 t.) (iron)	2100	225 0	43 7	5	10	..	13 6	1	320	2 15-in. 19-ton smooth-bores	..	1864	..	6·00	160	..

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corv., corvette; *cr.*, cruiser; *d.v.*, despatch-vessel; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; *sl.*, sloop; P., deck protected throughout; *p.p.*, partial deck protected; f. tu. or l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
sl.	**Adams** . . .	1375	183 9	36 0	wood	14 2	1	800	1 8-in. 8-ton smooth-bore, 4 9-in. 4-ton do., 1 60-pdr. M.L.R., 2 l., 3 M.	..	1874	..	9·00	140	..
g.v.	**Alert**	1020	173 10	31 10	iron	12 10	1	656	1 8-in. 7¾-ton smooth-bore, 2 9-in. 4-ton do., 1 60-pdr. B.L.R.	..	1874	..	9·00	140	..
sl.	**Alliance** . . .	1375	183 9	36 0	wood	14 2	1	774	1 8-in. 8-ton M.L.R., 4 9-in. 4-ton do., 1 60-pdr. M.L.R., 2 l., 1 M.	..	1875	..	9·00	130	..
cr. p.p.	**Atlanta** . . .	3189	270 0	42 0	steel	17 0	1	3511	2 8-in. 11¾-ton B.L.R., 6 6-in. 5-ton do., 4 Q.F., 8 M.	..	1884	123,600	16·33	400	5000
„ P.	**Baltimore** . . .	4413	315 0	48 6	„	19 6	2	10750	4 8-in. 11¾-ton B.L.R., 6 6-in. 5-ton do., 6 Q.F., 7 M.	5 f. tu. or l.car	1888	210,000	19·00	900	12000
„ „	**Bennington** (was Gun-boat No. 3)	1700	230 0	36 0	„	14 0	2	3400	6 6-in. B.L.R., 4 Q.F., 5 M. . . .	..	Building	98,000	16·00	400	9000
„ *p.p.*	**Boston** . . .	3189	270 0	42 0	„	17 0	1	3780	2 8-in. 11¾-ton B.L.R., 6 6-in. 5-ton do., 4 Q.F., 8 M.	..	1884	123,200	15·00	780	5000
fr. cr.	**Brooklyn** . .	3000	232 11	42 7	wood	19 4	1	1165	12 9-in. 4-ton smooth-bores, 1 8-in. do., 1 60-pdr. B.L.R., 8 M.	..	1858	..	10·00	275	..
P.	**Charleston** . .	3730	300 0	46 0	steel	18 6	2	7500	2 8-in. B.L.R., 6 6-in. 5-ton do., 4 Q.F., 9 M.	4 f. tu. or l.car	1888	..	18·00	800	..
p.p.	**Chicago** . . .	4500	315 0	48 2	„	19 0	2	5000	4 8-in. B.L.R., 8 6-in. do., 2 5-in. do., 2 Q.F., 10 M.	..	1885	177,800	15·00	940	6000
cr.	**Concord** (was Gun-boat No. 4) . . .	1700	230 0	36 0	„	14 0	2	3400	6 6-in. B.L.R., 4 Q.F., 5 M. . . .	..	Building	98,000	16·00	400	9000
d.v.	**Dolphin** . . .	1485	239 6	31 10	„	14 2	1	2300	1 6-in. 5-ton B.L.R., 2 Q.F., 4 M. . .	..	1884	61,000	15·50	310	..
sl.	**Enterprise** . .	1375	183 9	36 0	wood	14 2	1	800	1 8-in. 8-ton smooth-bore, 4 9-in. 4-ton do., 1 60-pdr. do. M.L.R., 9 l., 1 M.	..	1874	..	10·00	140	..

UNITED STATES.—Unarmoured Ships—*continued.*

corv., corvette; *cr.*, cruiser; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; *sl.*, sloop; P., deck protected throughout; *p.p.*, partial deck protected; f. tu. or l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
sl.	**Essex**	1375	183 9	36 0	wood	14 2	1	800	1 8-in. 8-ton smooth-bore, 4 9-in. 4-ton do., 1 60-pdr. M.L.R., 2 l., 1 M.	..	1874	..	10·00	140	..
corv.	**Galena**	1900	216 6	36 0	„	16 5	1	940	1 8-in. 8-ton B.L.R., 6 9-in. 4-ton smooth-bores, 1 60-pdr. B.L.R., 4 l., 1 M.	..	1877	..	10·00	125	..
fr. cr.	**Hartford**	2900	226 4	42 7	„	18 4	1	1024	12 9-in. 4-ton smooth-bores, 1 8-in. 8-ton do., 4 M., 2 l.	..	1858	..	9·00	241	..
corv.	**Iroquois**	1575	200 2	32 10	„	15 1	1	813	1 11-in. 7¾-ton smooth-bore, 5 8-in. 4-ton do., 1 60-pdr. M.L.R., 1 l., 1 M.	..	1858	..	8·00	128	..
„	**Juniata**	1900	203 5	39 4	„	16 5	1	1304	1 8-in. 8-ton smooth-bore, 6 9-in. 4-ton do., 1 60-pdr., 4 l., and 1 M.	..	1862	..	9·00	235	..
„	**Kearsarge**	1550	196 10	32 10	„	15 9	1	822	2 8-in. 8-ton smooth-bores, 4 9-in. 4-ton do., 1 60-pdr. B.L.R., 1 l., 1 M.	..	1861	..	9·00	165	..
fr. cr.	**Lancaster**	3250	236 3	45 11	„	19 1	1	2000	10 8-in. smooth-bores, 8 M.	..	1859	..	9·60	288	..
corv.	**Marion**	1900	216 6	37 0	„	16 5	1	1172	6 9-in. 4-ton smooth-bores, 1 8-in. 8-ton M.L.R., 1 60-pdr. B.L.R., 3 l., 1 M.	..	1873	..	11·00	156	..
corv.	**Mohican**	1900	216 6	37 0	„	16 5	1	1172	6 9-in. 4-ton smooth-bores, 1 8-in. 8-ton B.L.R. 1 60-pdr. B.L.R., 2 l., 3 M.	..	1882	..	11·00	160	..
fr. cr. P.	**Newark**	4083	310 0	49 0	steel	18 9	2	8500	12 6-in. 5-ton B.L.R., 4 6-pdr. Q.F., 9 M.	6 f. tu. or l.car	Building	250,000	18·00	850	10,500
„	**New York**	4527	314 11	45 11	wood	..	1	8500	.. ..	..	Building since 1865		17·50	900	..
sl.	**Nipsic**	1375	183 9	36 0	„	14 2	1	1375	4 9-in. 4-ton smooth-bores, 1 8-in. 8-ton do., 1 60-pdr. M.L.R., 2 l., 1 M.	..	1878	..	11·00	130	..
fr. cr.	**Omaha**	2400	249 4	39 4	„	16 5	1	1150	10 9-in. 4-ton smooth-bores, 1 8-in. 8-ton	..	1868	..	12·00	150	..

fr. cr.	**Pensacola**	3000	229	7	42	7	,,	18	9	1	1165	2 9-in. 8-ton smooth-bore, 2 80-pdr. B.L.R. do., 2 60-pdr. do., and 4 M.	..	1859	..	9·00	310	..
cr.	**Petrel** (was Gun-boat No. 2)	890	175	0	31	0	steel	11	7	1	1300	4 6-in. B.L.R., 2 3-pdr. Q.F., 5 M. . .	..	1888	50,000	13·0	160	..
cr.	**Philadelphia** (was Cruiser No. 4) . P.	4413	315	0	48	6	,,	19	3	2	10,500	4 8-in. B.L.R., 6 6-in. do., 6 Q.F., 7 M. .	5 f. tu. or l.car	Building	265,000	19·0	..	..
corv.	**Quinnebaug** . .	1900	216	6	36	0	wood	16	5	1	1103	6 9-in. 4-ton smooth-bores, 1 8-in. 8-ton B.L.R. 1 60-pdr. B.L.R., 3 l.	..	1875	..	9·00	160	..
g.v.	**Ranger** (Surveying) .	1020	173	10	31	10	iron	12	10	1	656	1 60-pdr. M.L. Parrott	..	1874	..	8·00	127	..
fr. cr.	**Richmond** . .	2700	226	4	42	7	wood	17	4		1078	12 9-in. 4-ton smooth-bore, 1 8-in. 8-ton do., 1 60-pdr. M.L.R., 2 l., and 6 M.	..	1860	..	9·00	290	..
cr. P.	**San Francisco** (was Cruiser No. 5)	4083	310	0	49	2	steel	18	9	2	10,500	12 6-in. B.L.R., 6 Q.F., 7 M. . . .	6 f.tu. or l.car	Building	270,000	19·0	..	..
corv.	**Swatara** . . .	1900	216	6	36	0	,,	16	5	1	1176	6 9-in. 4-ton smooth-bores, 1 8-in. 8-ton B.L.R. 1 60-pd. B.L.R., 4 l., 1 M.	..	1873	..	9·00	186	..
fr. cr.	**Trenton** . . .	3900	252	7	49	3	wood & iron	20	4	1	3100	11 8-in. 8-ton M.L.R. (Palliser's), 6 l. .	..	1876	..	12·80	342	..
corv.	**Vandalia** . . .	2100	216	6	39	4	wood	17	4	1	1176	6 9-in. 4-ton smooth-bores, 1 8-in. 8-ton B.L.R. 1 60-pdr. B.L.R., 3l., 3M. . . .	..	1874	98,726	10·00	218	..
cr.	**Vesuvius** (Dynamite Gun Cruiser)	725	246	0	26	6	,,	9	0	2	3200	3 dynamite guns, 10½ in. cal., 2 Q.F., 5 M.	..	1888	70,000	20·00	28	..
g.v.	**Yantic** . . .	900	180	5	29	6	,,	12	2	1	670	1 8-in. 8-ton smooth-bore, 2 9-in. 4-ton do., 1 60-pdr. M.L.R., 2 l. 1 M.	..	1878	..	8·00	125	..
cr.	**York Town** (was Gun-boat No. 1)	1700	230	0	36	0	steel	14	0	2	3400	6 6-in. B.L.R., 4 Q.F., 5 M. . . .	..	1888	98,000	16·0	400	9000

NOTE.—Congress has sanctioned the building of six protected cruisers; one of 5300 tons displacement and 20 knots speed, two of 3000 tons displacement and 19 knots speed, and three of 2000 tons. Also a cruiser for training of 800 tons displacement.

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Paddle steamers.—Michigan (685 tons and 300 horse-power), Monocacy (1370 tons and 850 horse-power) Powhattan (3980 tons), Tallapoosa (1270 tons and 1100 horse-power).

Steamers (Fourth Rate), Despatch (560 tons, 402 I.HP.); Palos (420 tons and 350 horse-power); Fortune, Leyden, Mayflower, Nina, Pinta, Speedwell, Standish, Triana (each 450 tons and 440 I.HP); Catalpa (190 tons), Cohasset 450 tons), and Rescue (90 tons).

Torpedo boats.—Two torpedo-boats, built by Hereshoff, 136 feet long, 14 feet wide, 100 tons displacement, 1600 I.HP. and 22 knots speed and another of the same size ordered; two 128 feet long, and one 108 feet.

Submarine torpedo boats.—Nautilus, built in London, and the Peacemaker, built in America.

Surveying ships, training ships, store ships, harbour ships, tugs, &c., are not included in the above lists.

URUGUAY.

Gunboats.—General Artiga, 274 tons, 520 I.HP., two 12-cm. B.L.R. (30 calibres, Krupp), 2 M., launched 1884, 12·60 knots speed.

General Rivera, 300 tons, one 15-cm. B.L.R., one 6-cm. ditto, 12 knots speed, and the General Juarez (was Tastique).

Also an iron steamer of 400 tons displacement, the Malvinias, built at Elbing in 1882.

VENEZUELA.

Steamer.—Augusta, iron, launched in 1884.

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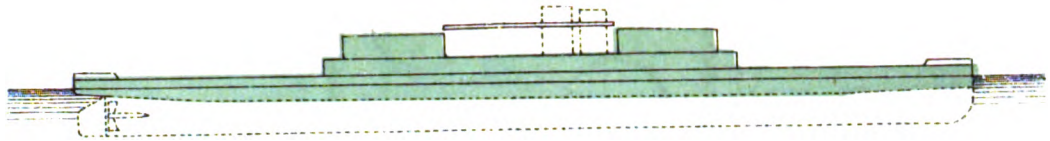
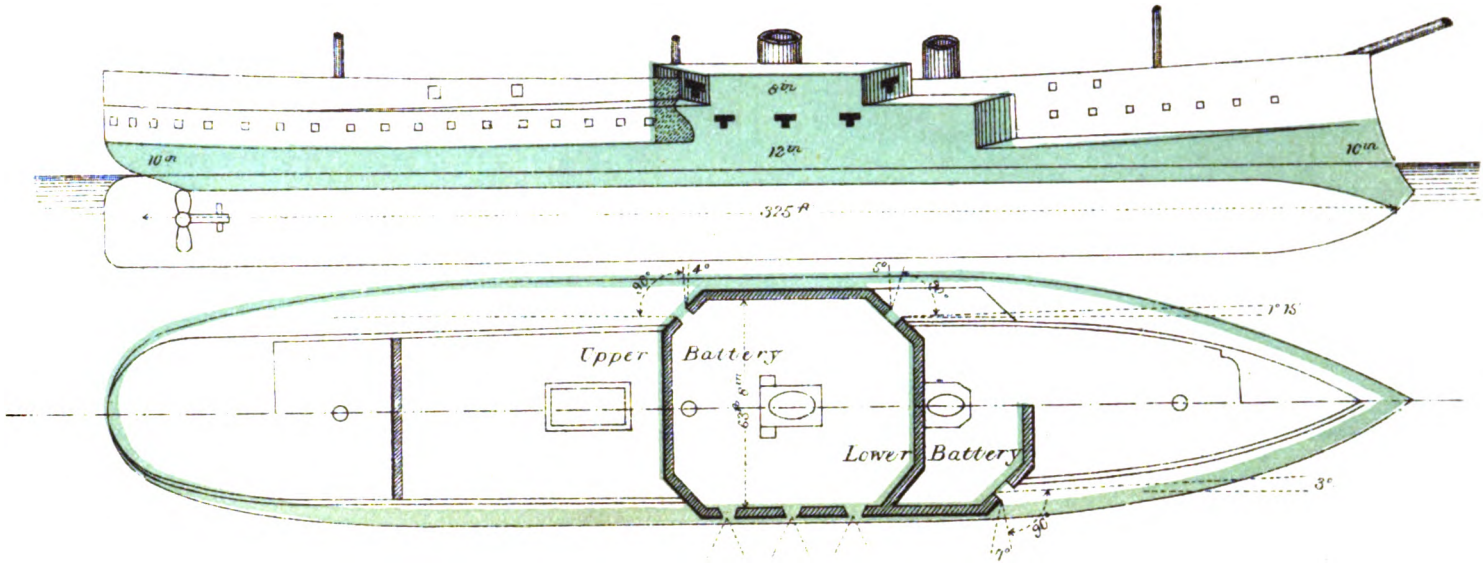
"Abyssinia." *(Indian Marine)*



"Alexandra."



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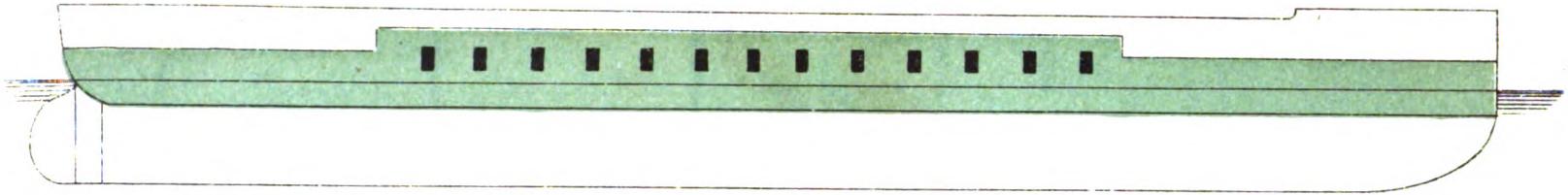
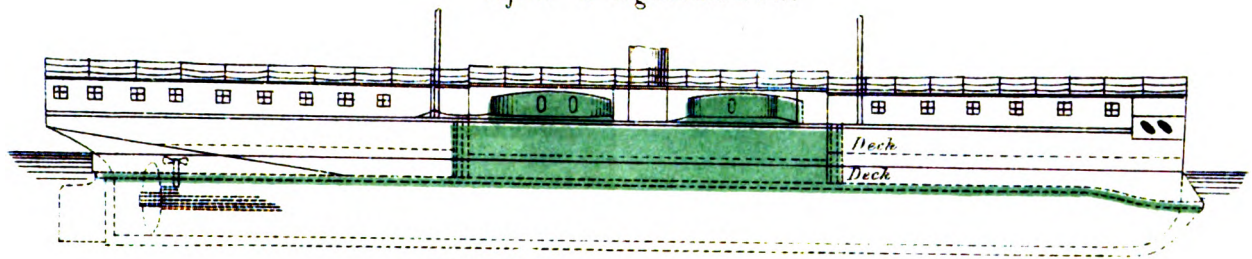
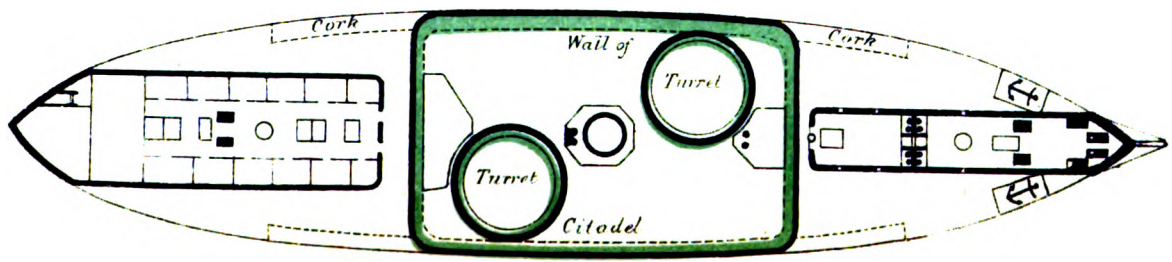
"Achilles".



"Ajax" & "Agamemnon".





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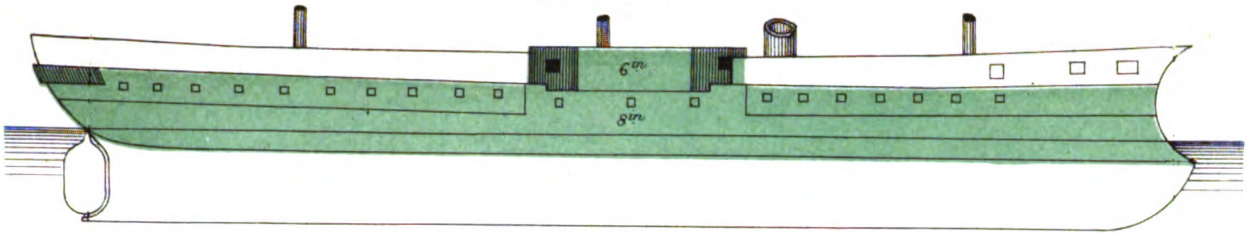
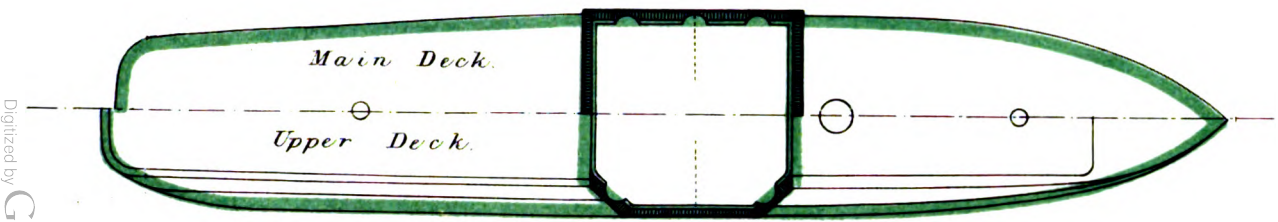
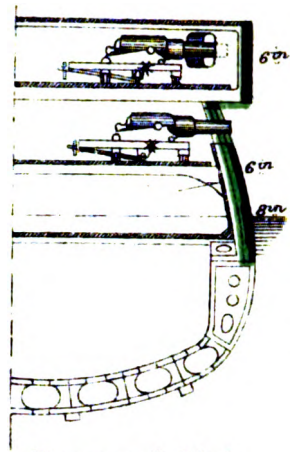
"Audacious"
Invincible
Iron Duke.







Upper and Main Batteries,
"Audacious" Class

HANHART, LITH

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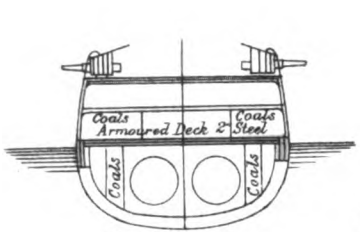
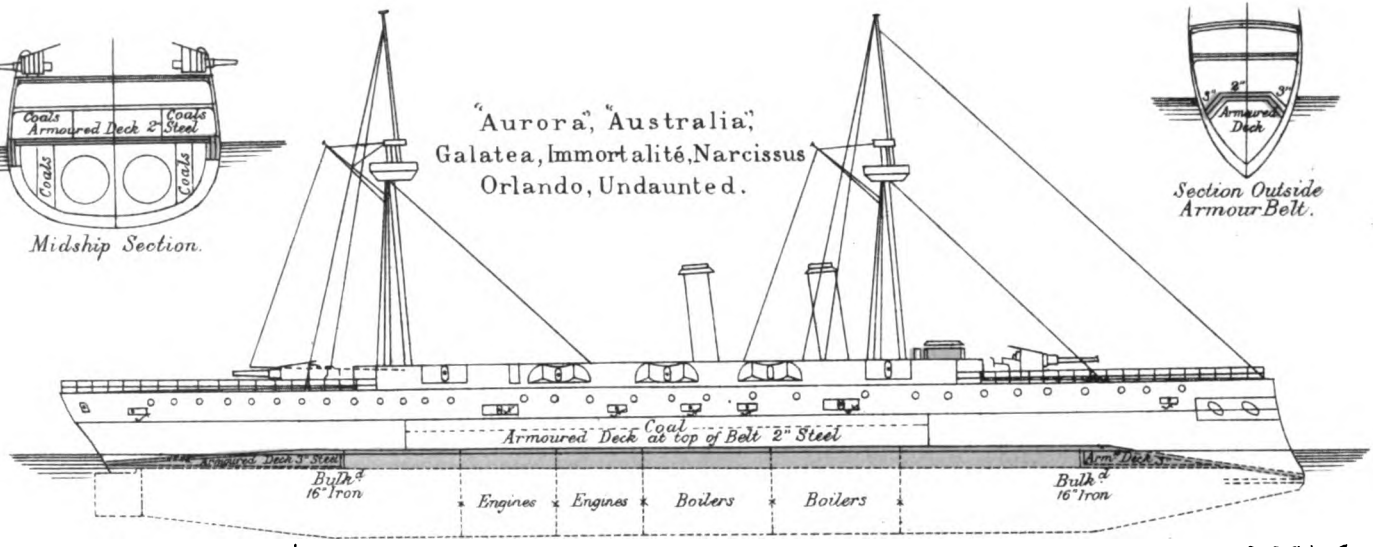


Midship Section.

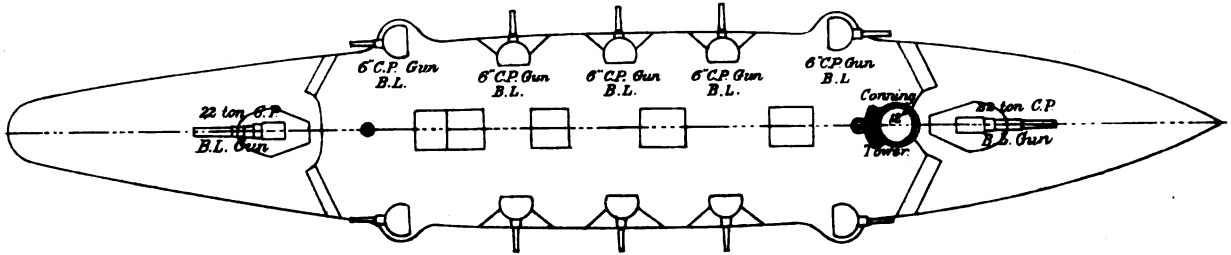
"Aurora", "Australia",
Galatea, Immortalité, Narcissus
Orlando, Undaunted.

Section Outside Armour Belt.



r Quick-firing Guns.

Upper Deck.



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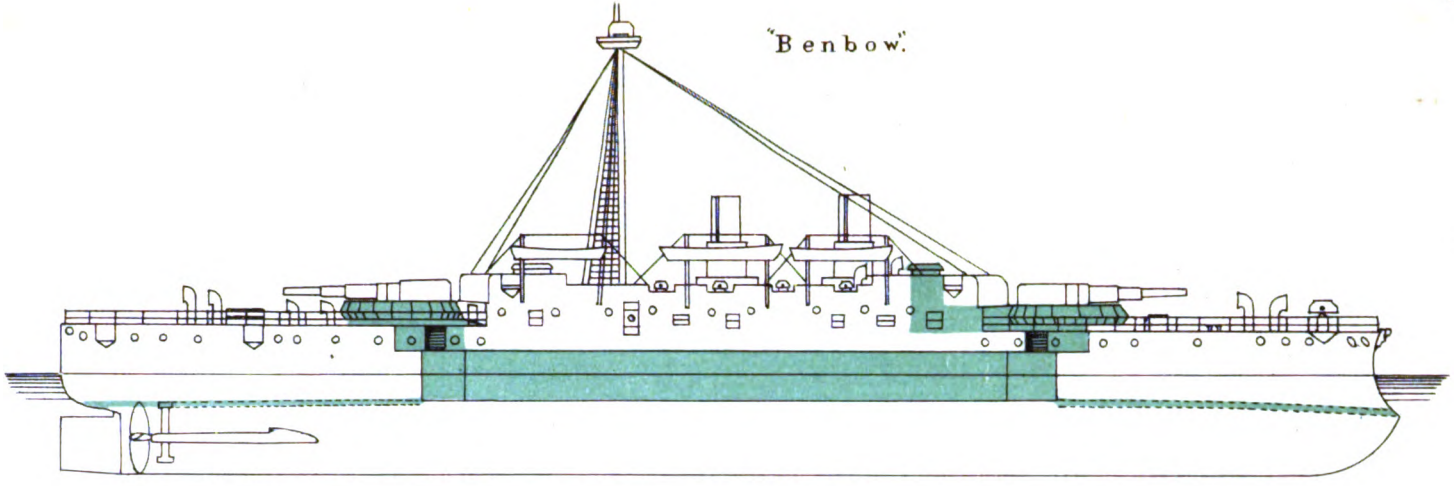
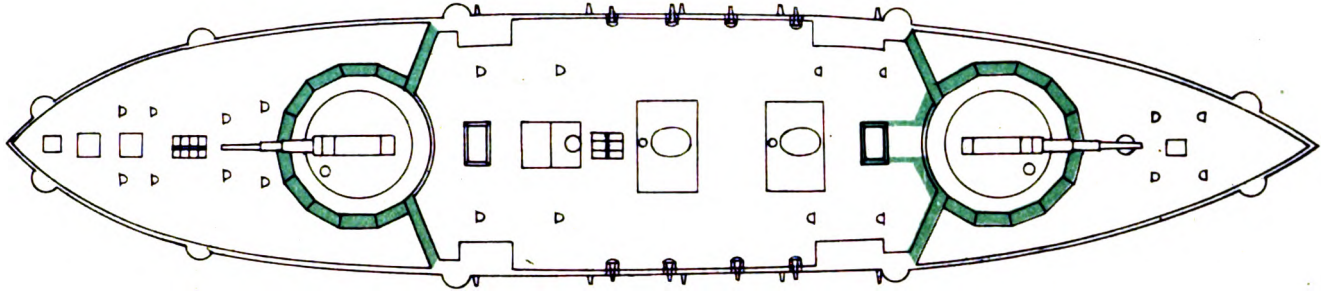
"Benbow."



Spar Deck.



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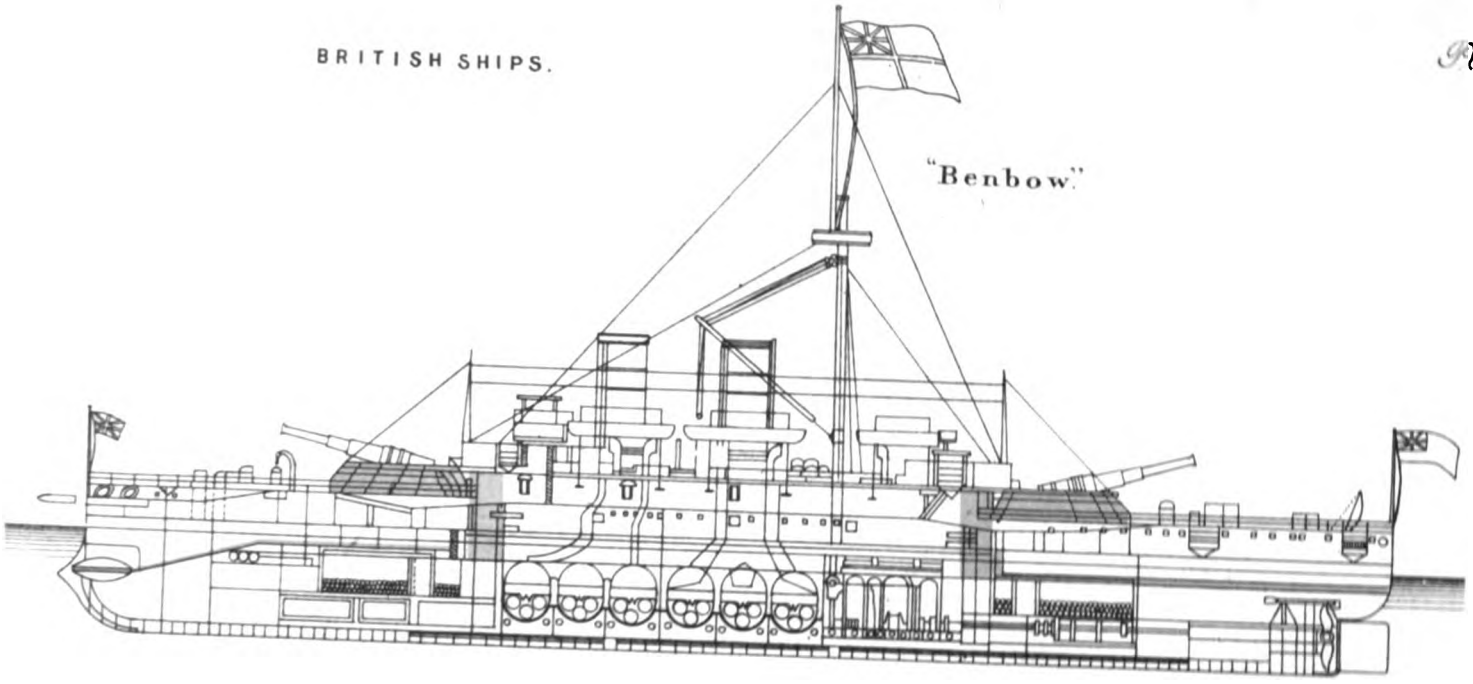
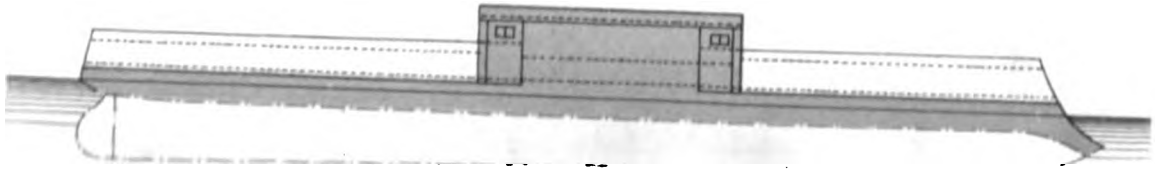
"Benbow."



"Belleisle & Orion."



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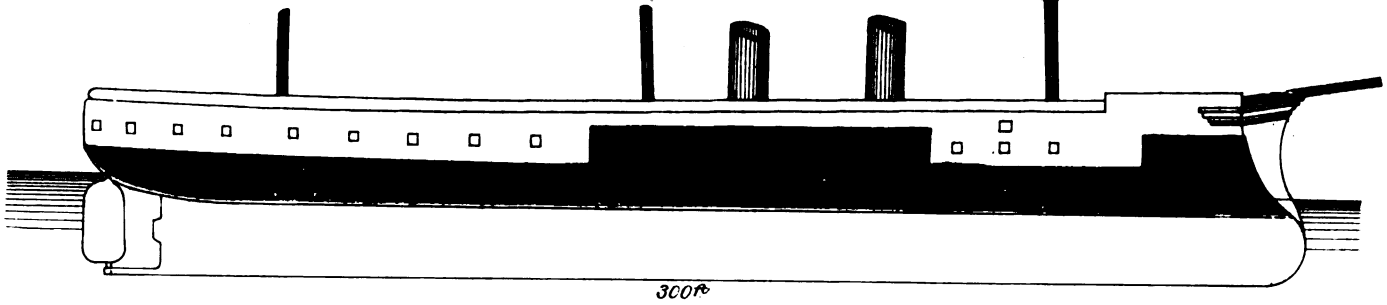
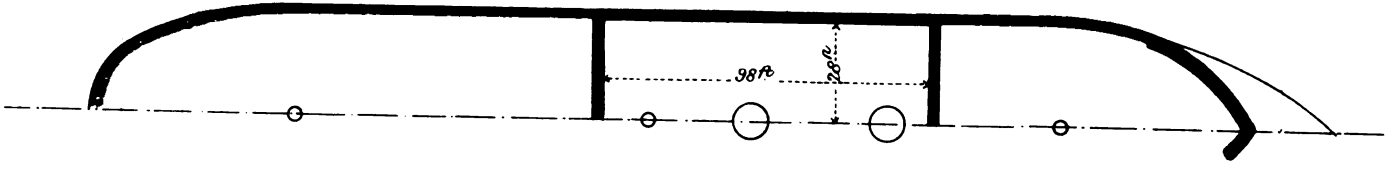
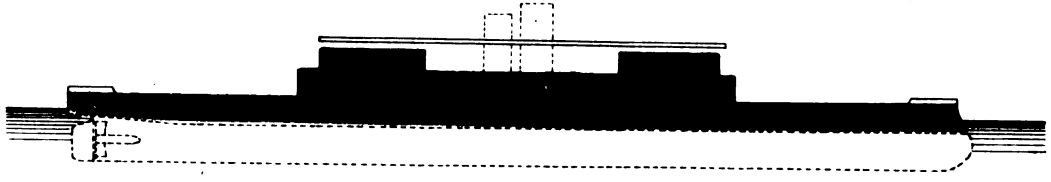




"Cerberus" & "Magdala." *(Colonial & Indian Marine respectively)*



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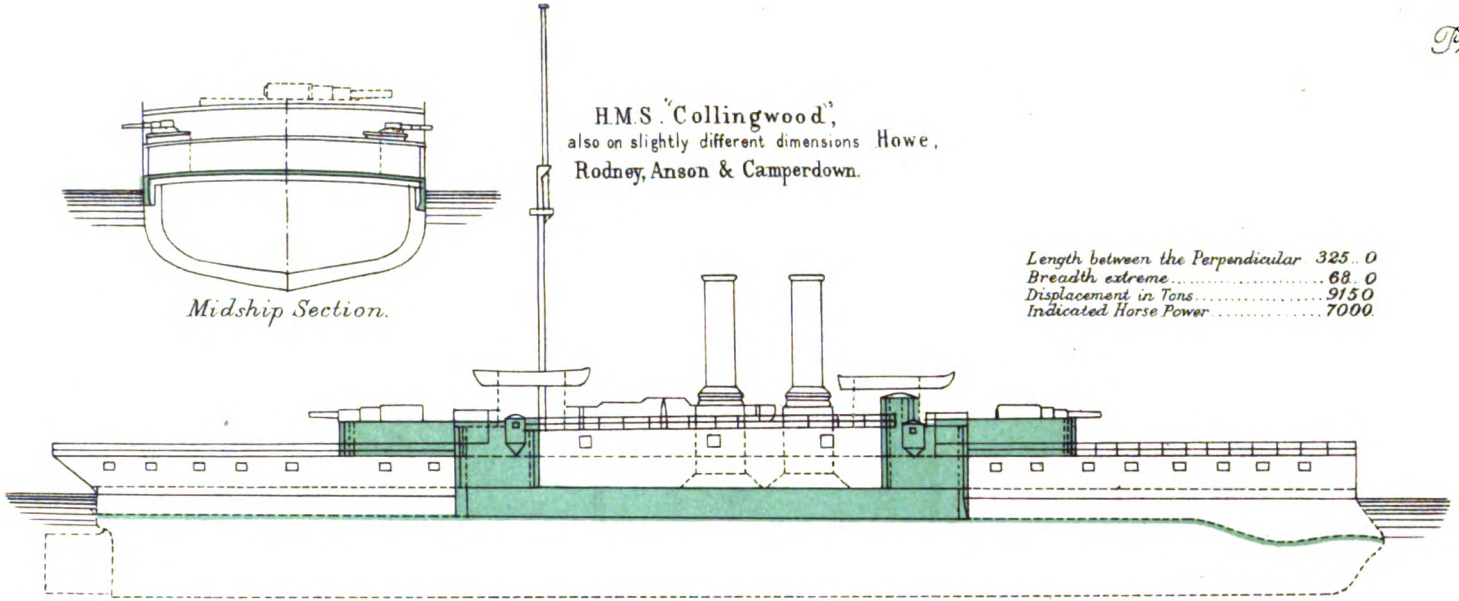
HANNART, LITH.

Pl. 8.

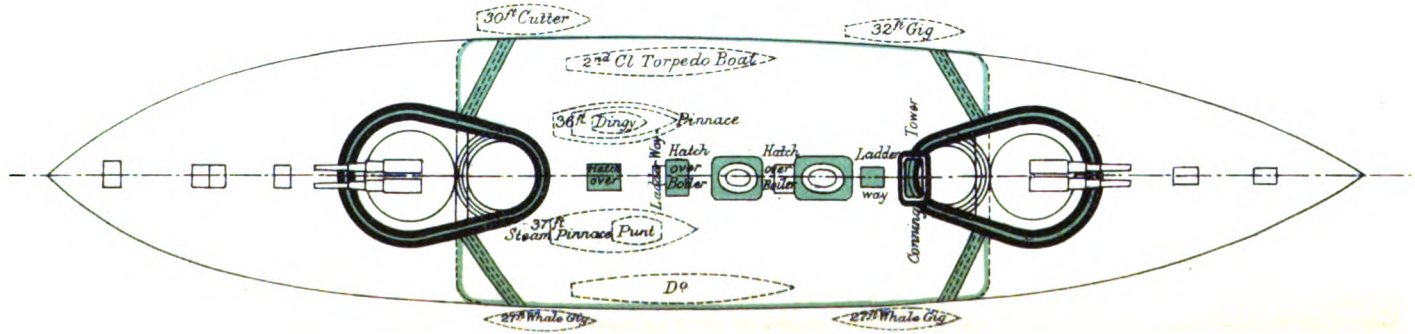
H.M.S. "Collingwood",
also on slightly different dimensions Howe,
Rodney, Anson & Camperdown.

Midship Section.

Length between the Perpendicular	325..0
Breadth extreme	68..0
Displacement in Tons	9150
Indicated Horse Power	7000



Plan of Spar & Upper Decks.



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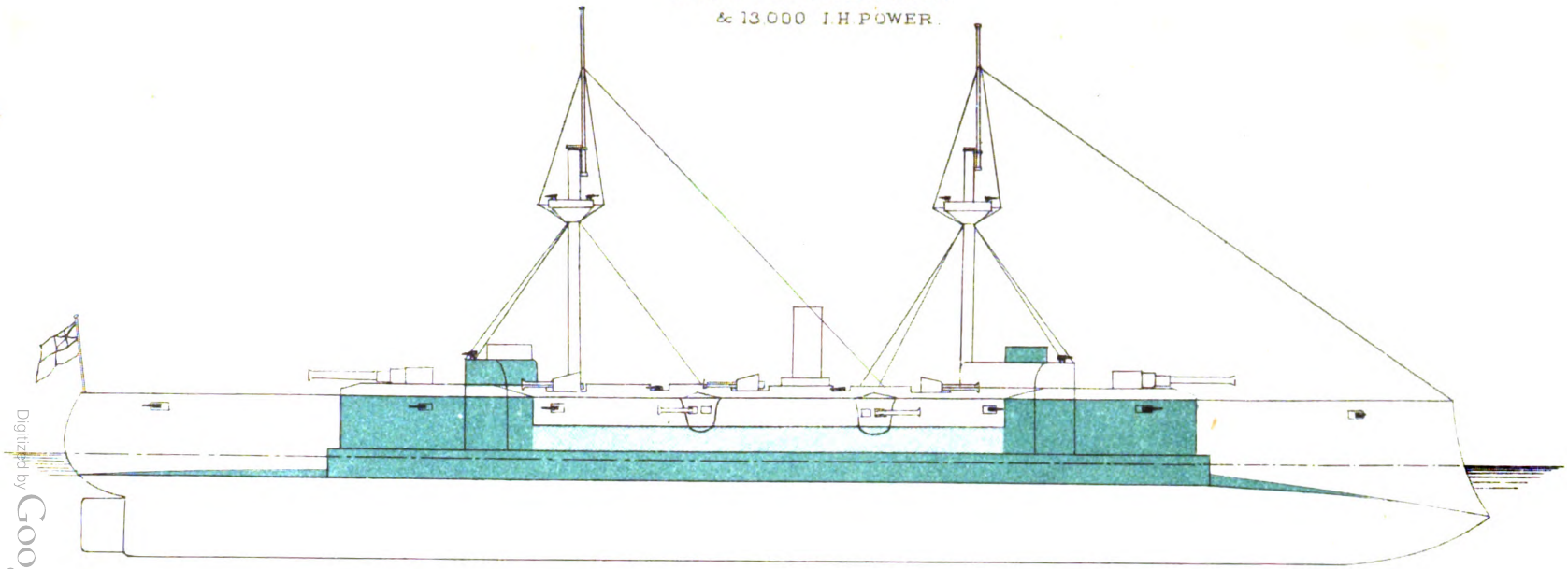
Pl. Ea

New Battle Ship, (Barbette) Design 1889.

of 14150 TONS DISPLACEMENT.
& 13.000 I.H.POWER.



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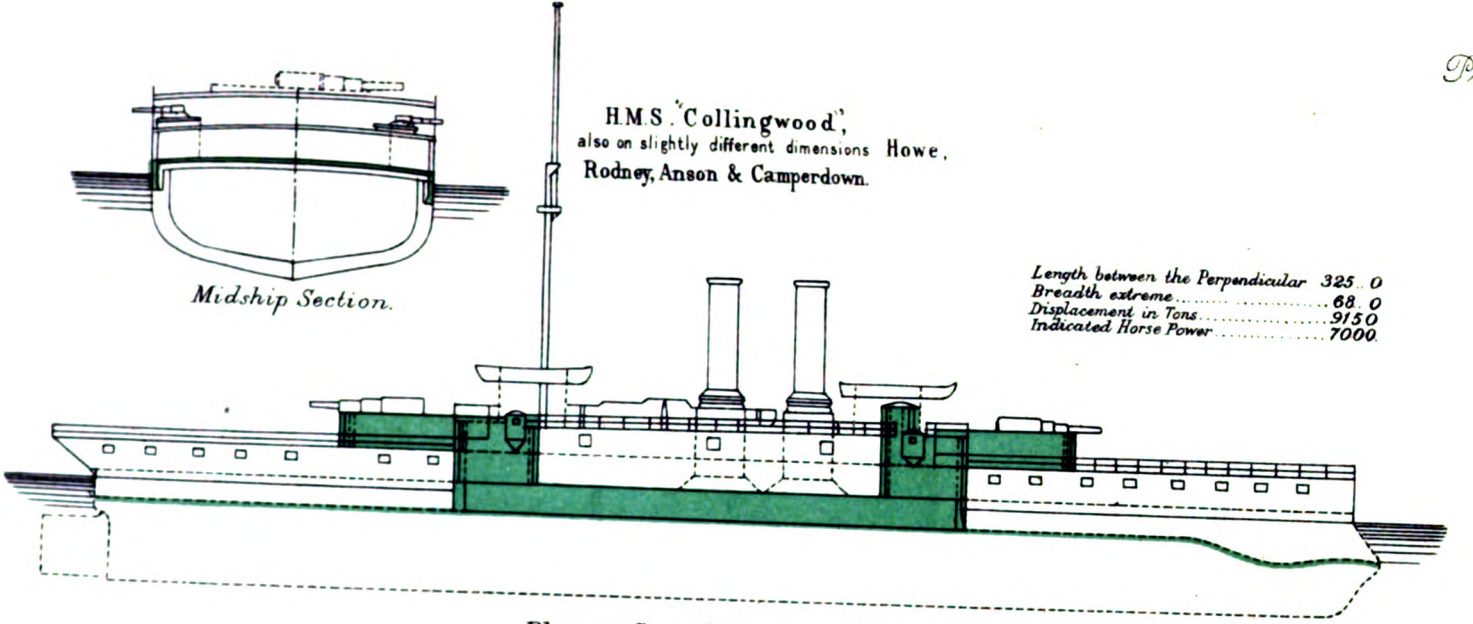
HANHART LITH.

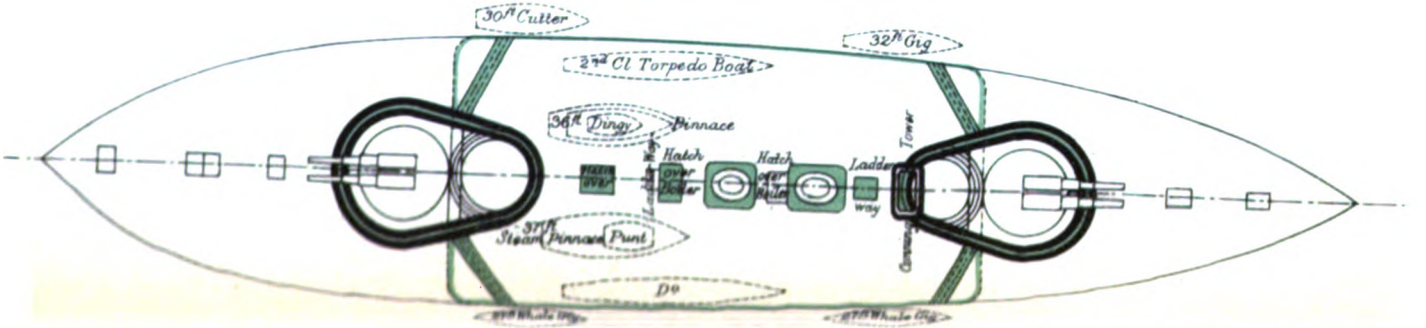
H.M.S. "Collingwood",
also on slightly different dimensions Howe,
Rodney, Anson & Camperdown.

Midship Section.

Length between the Perpendicular	325. 0
Breadth extreme	68. 0
Displacement in Tons	9150
Indicated Horse Power	7000



Plan of Spar & Upper Decks.

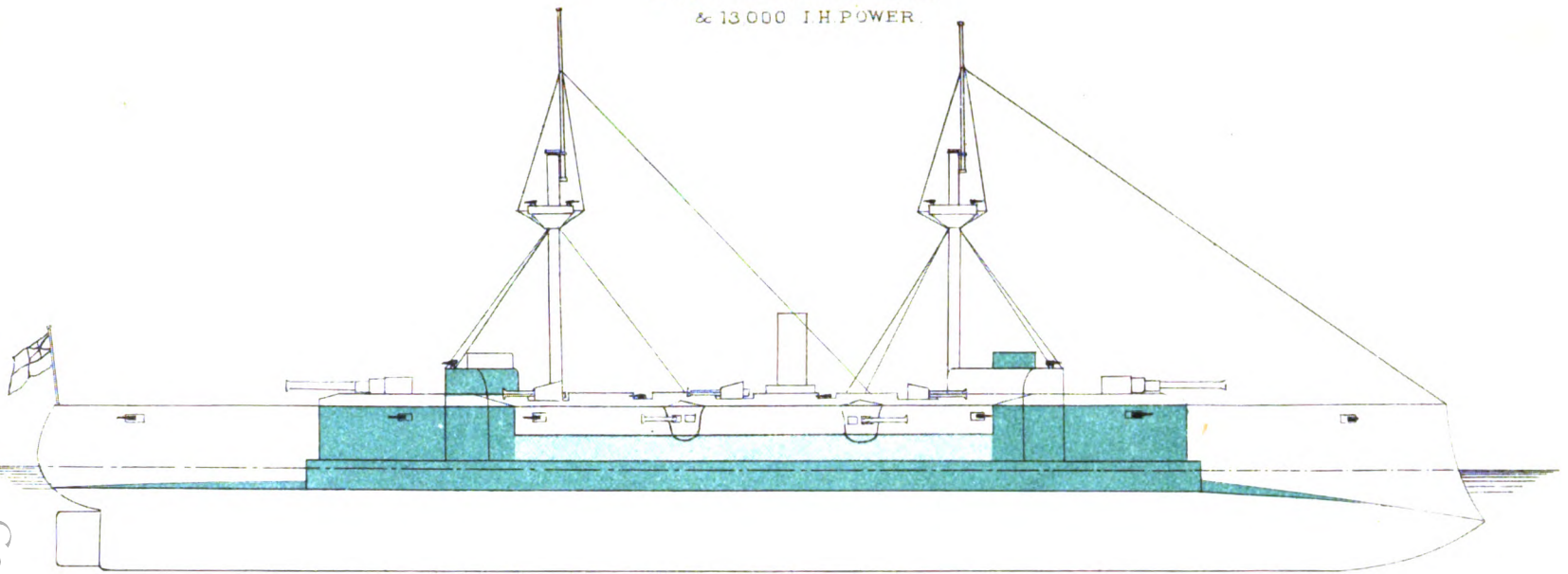


Digitized by Google

New Battle Ship, (Barbette) Design 1889.

of 14150 TONS DISPLACEMENT,

& 13000 I.H.POWER.



HANHART LITH.

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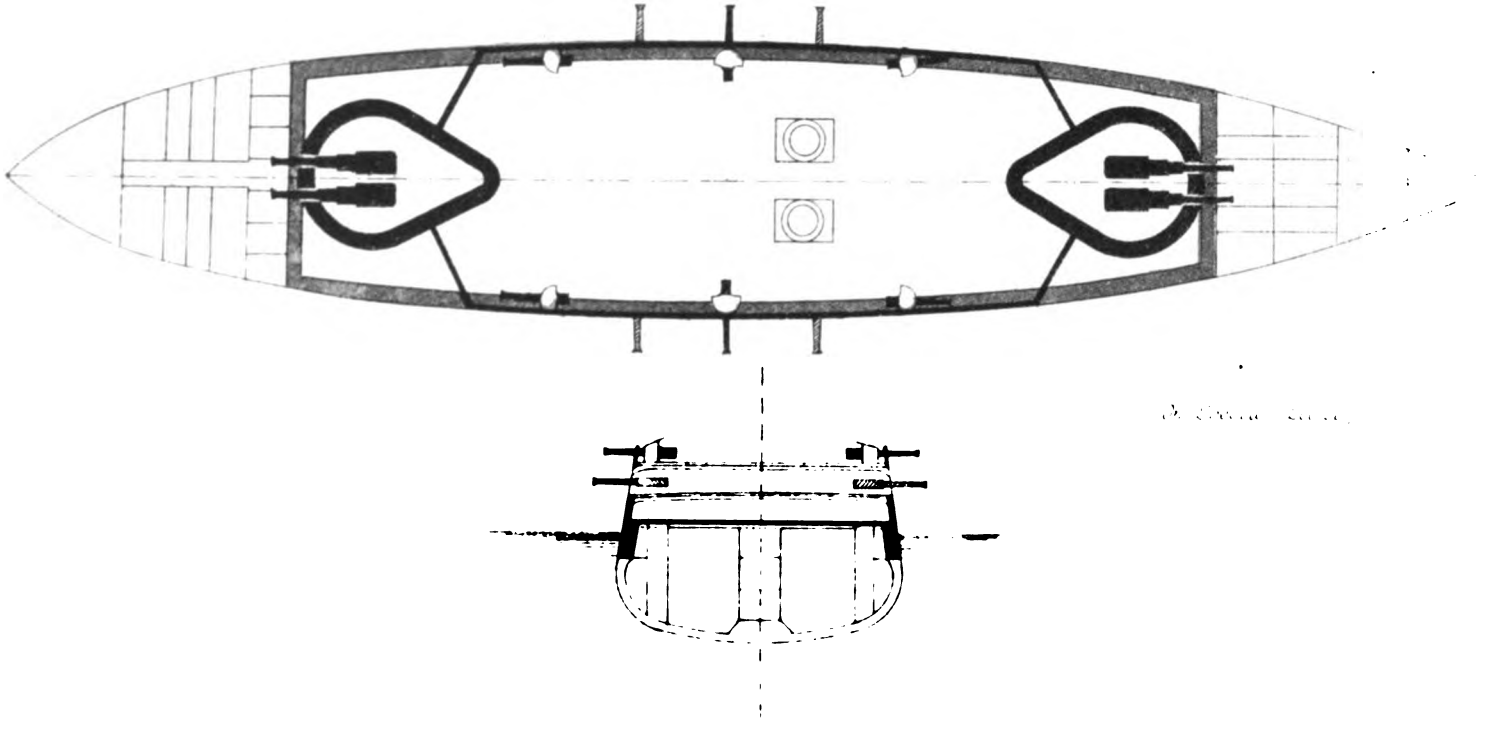

"NEW BARBETTE SHIP".
DESIGN

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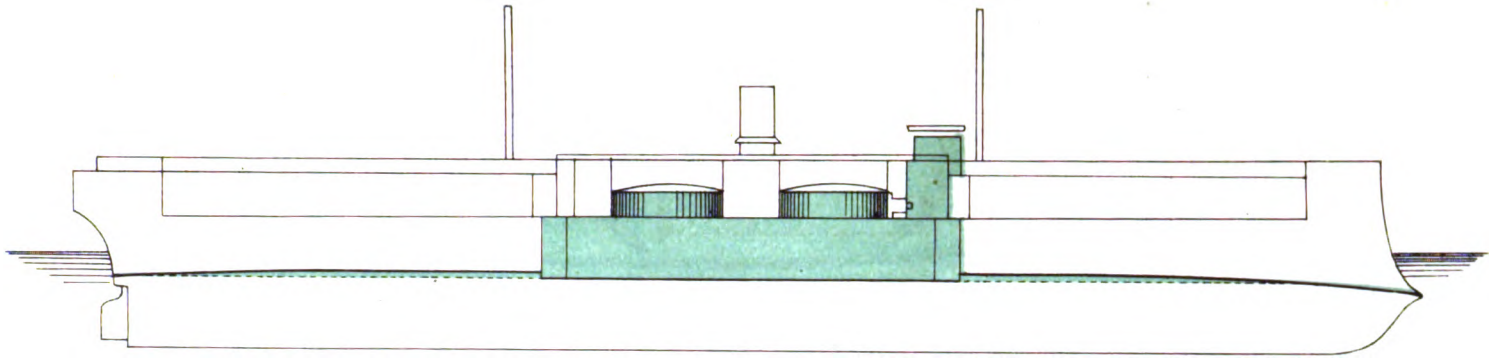
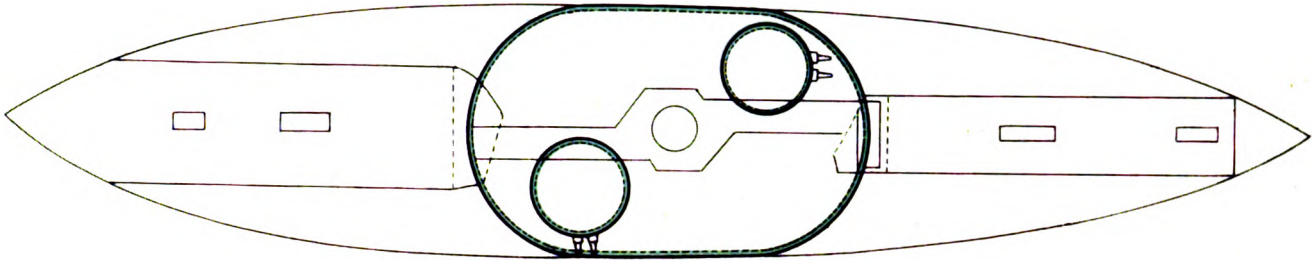
"Colossus" & "Edinburgh."





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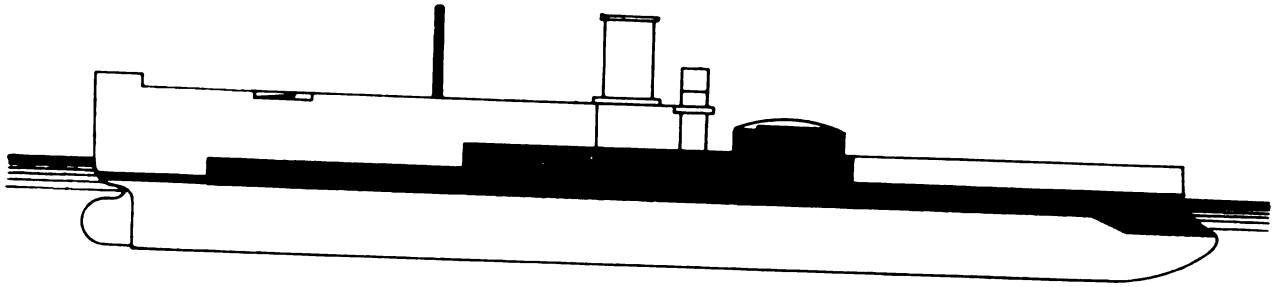
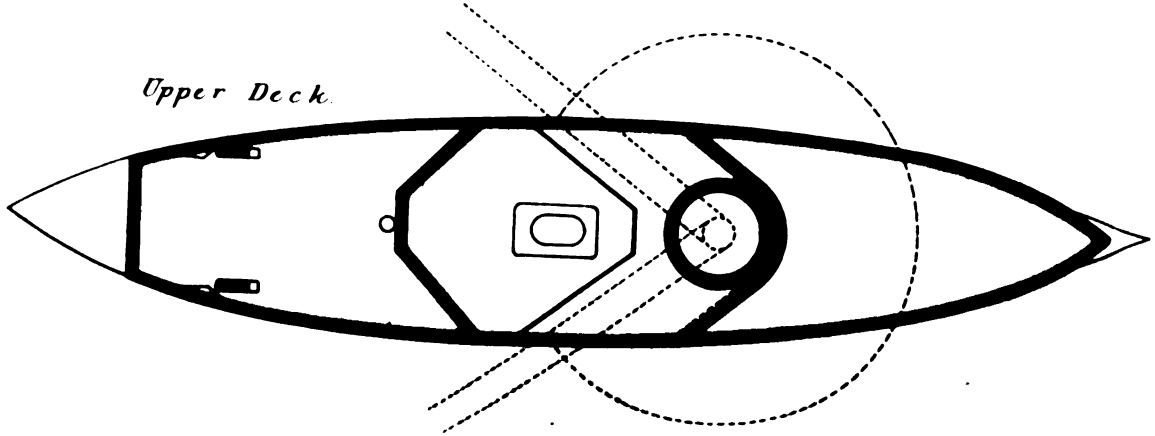
"Conqueror" & "Hero."





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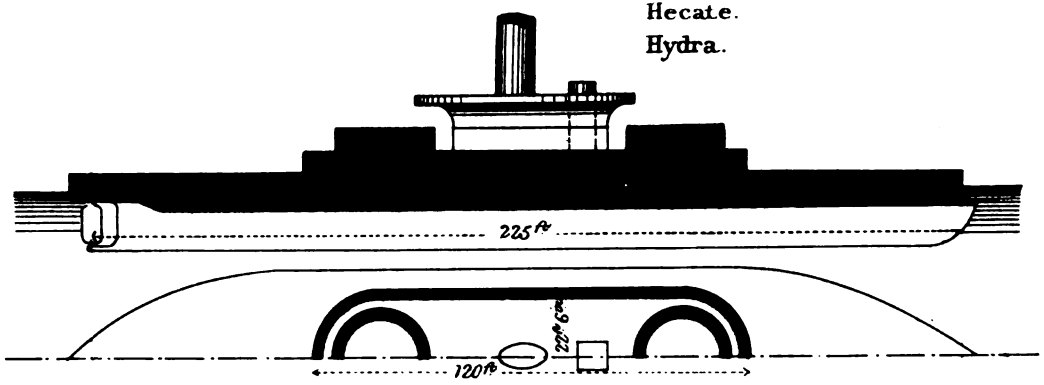
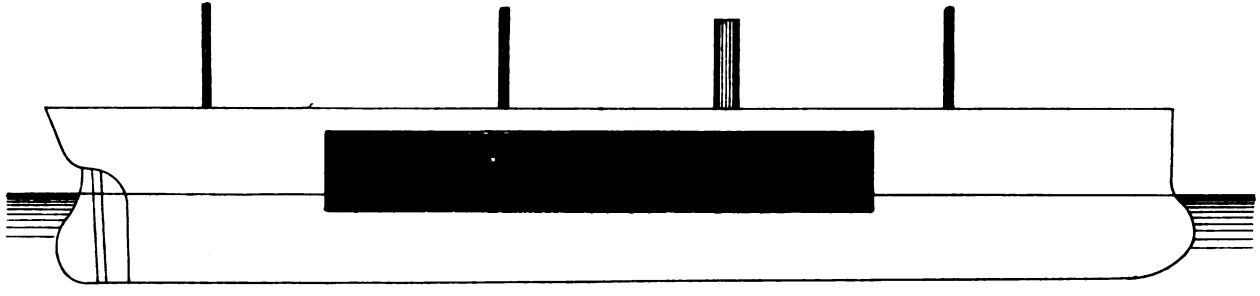
Cyclops. Gorgon.
Hecate.
Hydra.



"Defence."
Resistance.



HANHART, LITH

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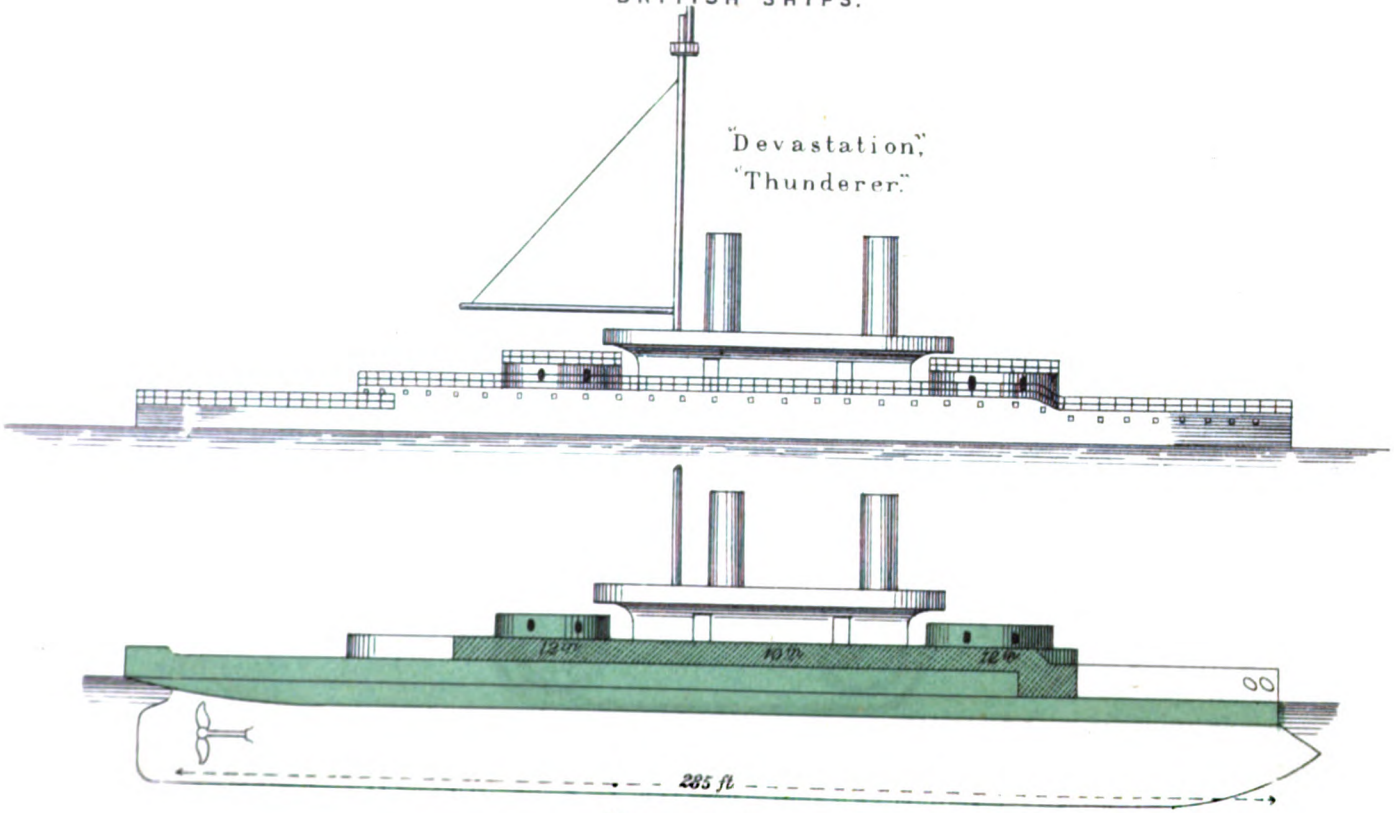
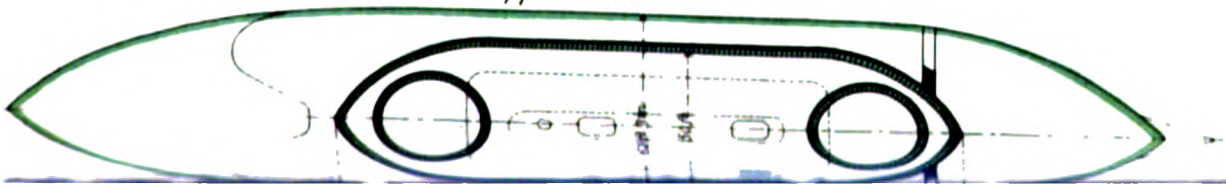
"Devastation."
"Thunderer."



Upper Deck.



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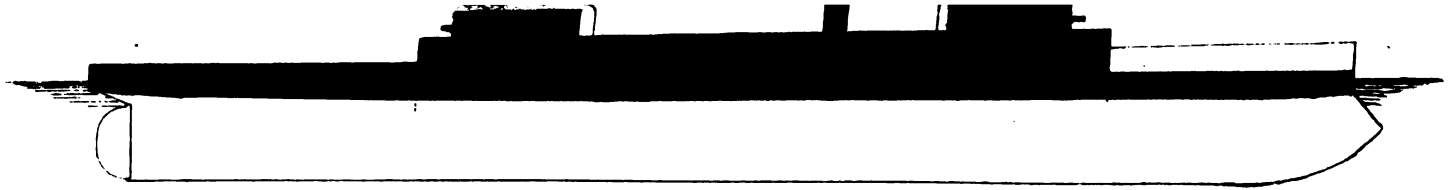

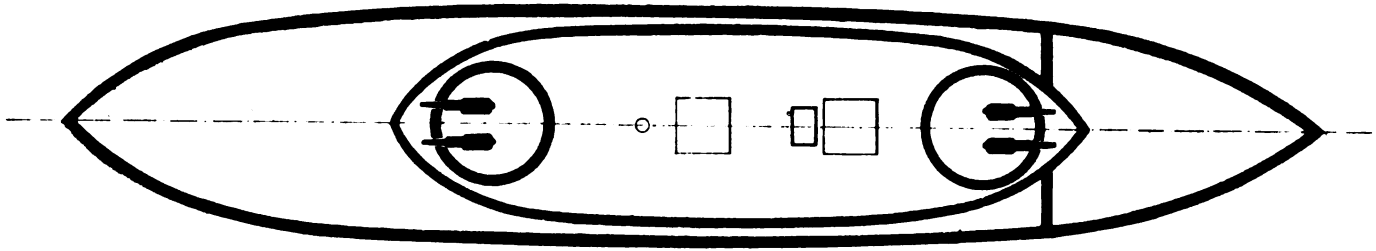

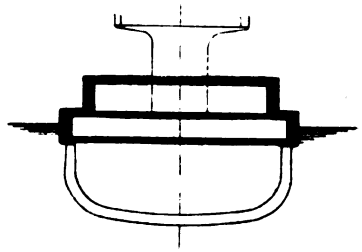

"FURY"

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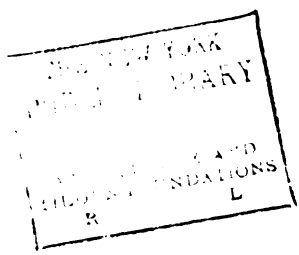
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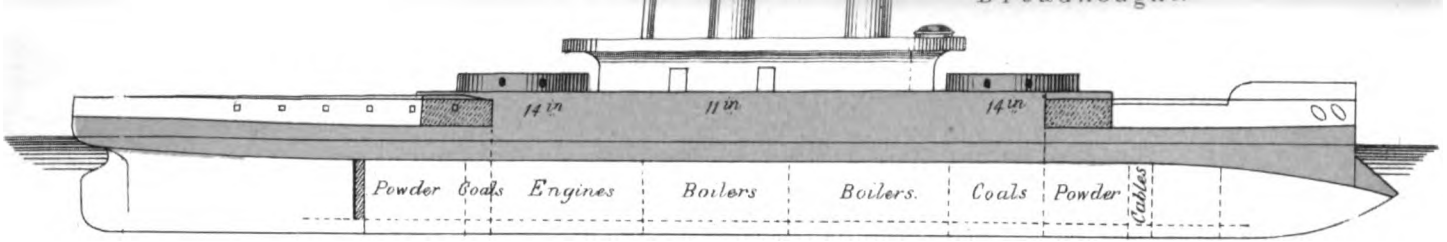

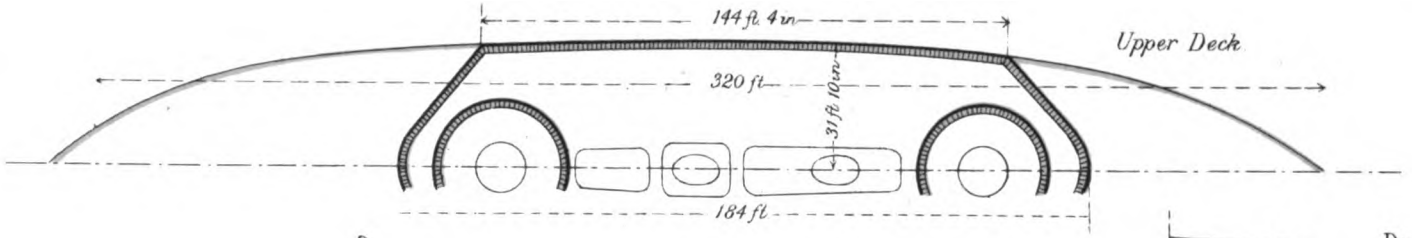

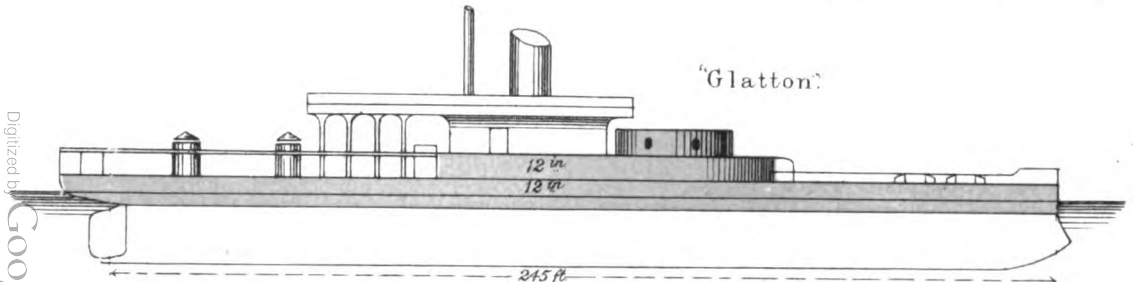

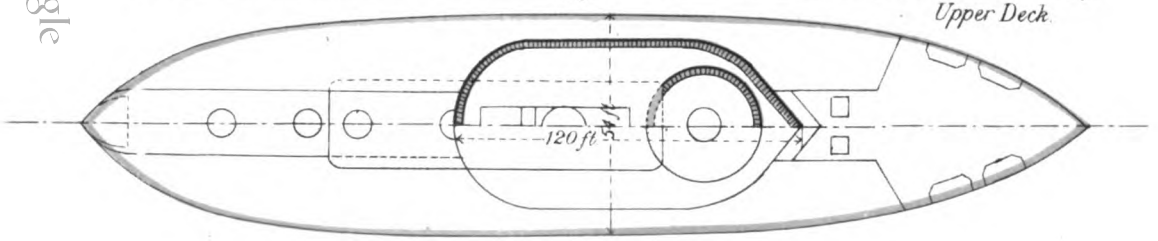

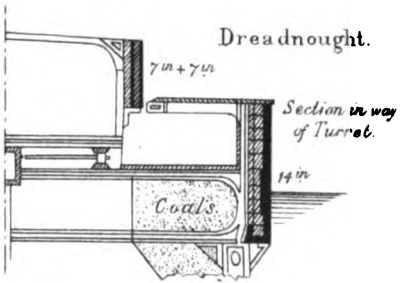

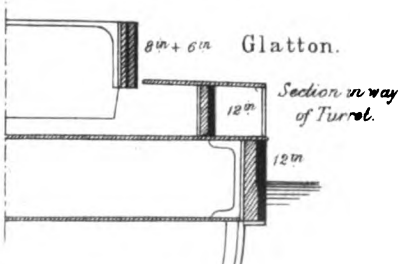

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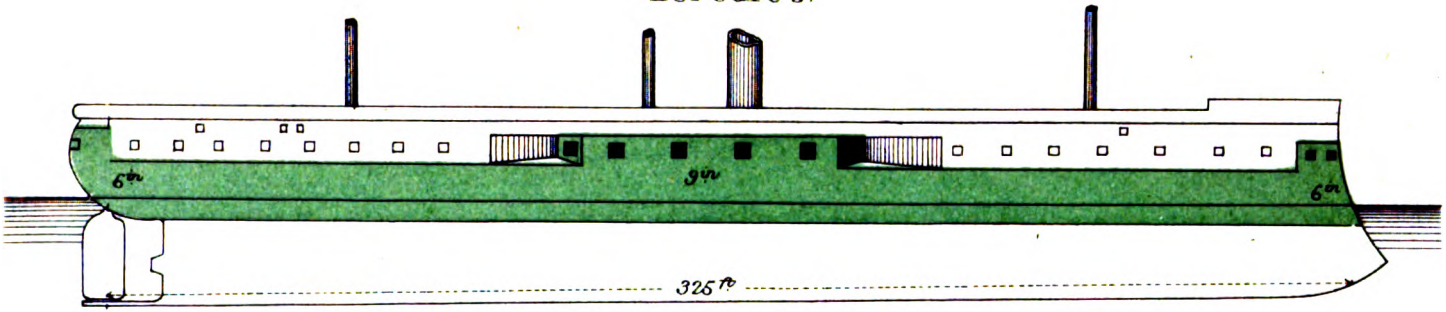
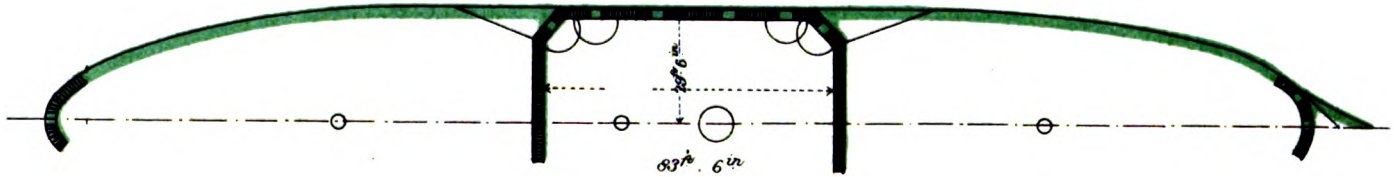
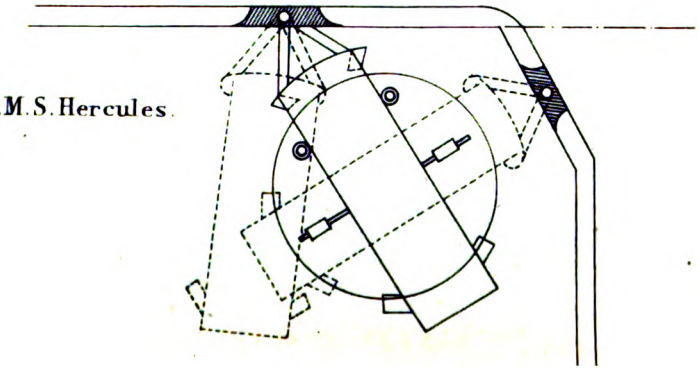
BRITISH SHIPS.

"Hercules."

Pl. 14.







Angle Port of H.M.S. Hercules.

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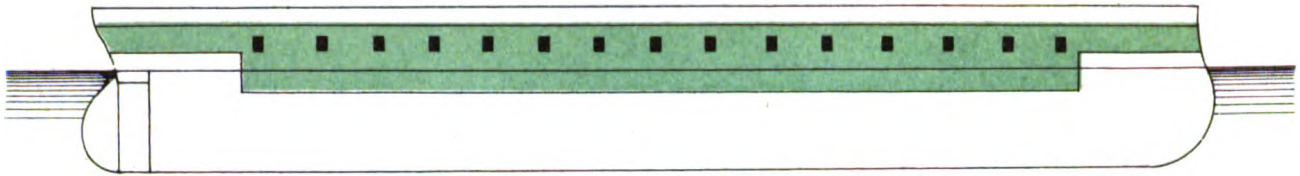
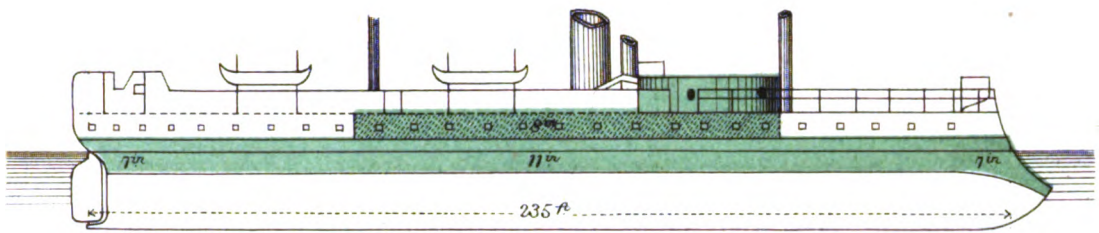
"Hector" & "Valiant."



"Hotspur."



HANHART, LITH.

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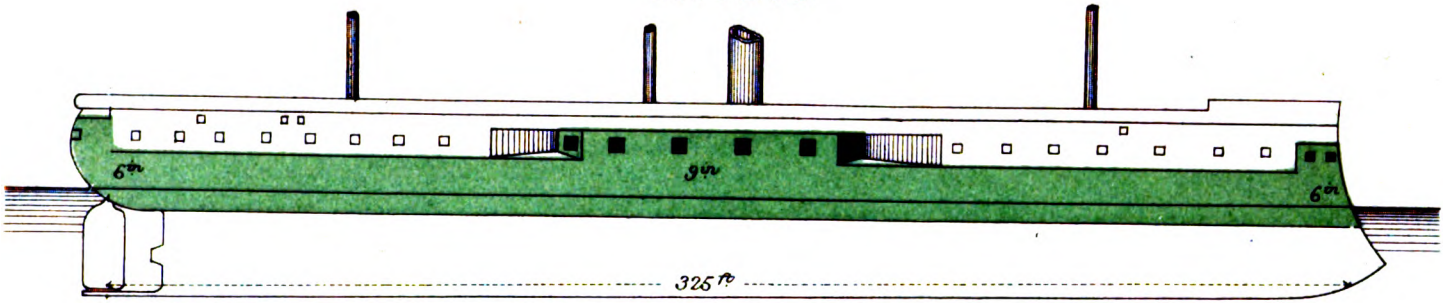
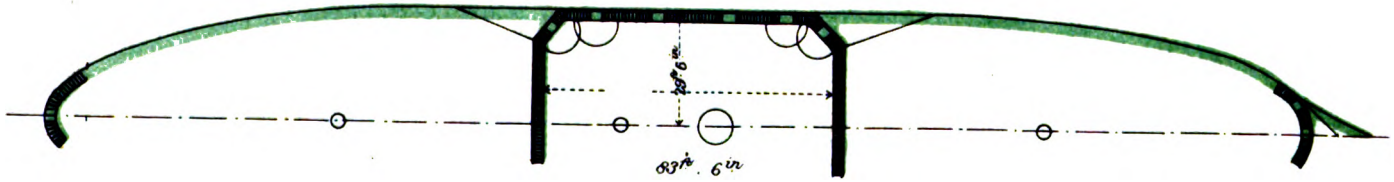
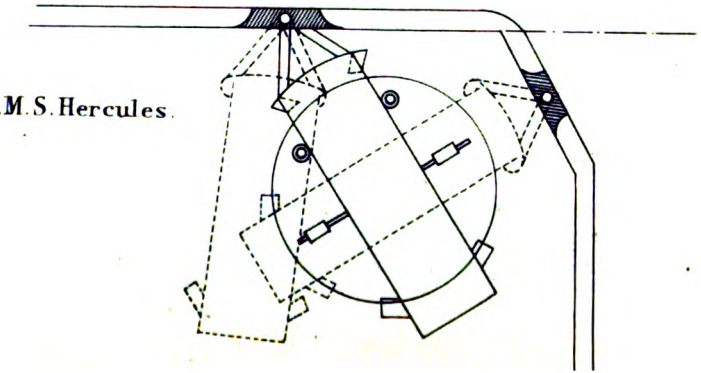
BRITISH SHIPS.

"Hercules."

Pl. 14.



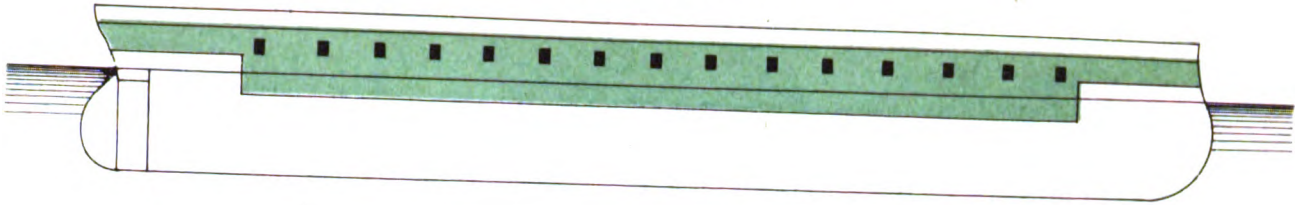




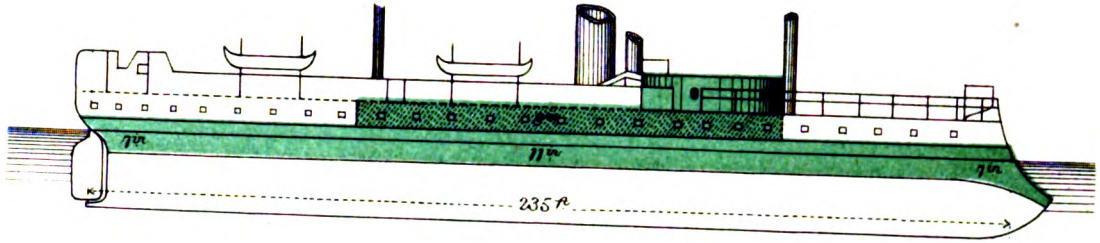
Angle Port of H.M.S. Hercules.

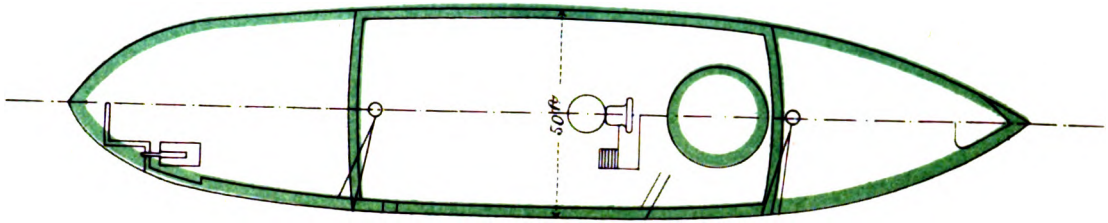
Digitized by Google

"Hector" & "Valiant."



"Hotspur."





HANHART, LITH

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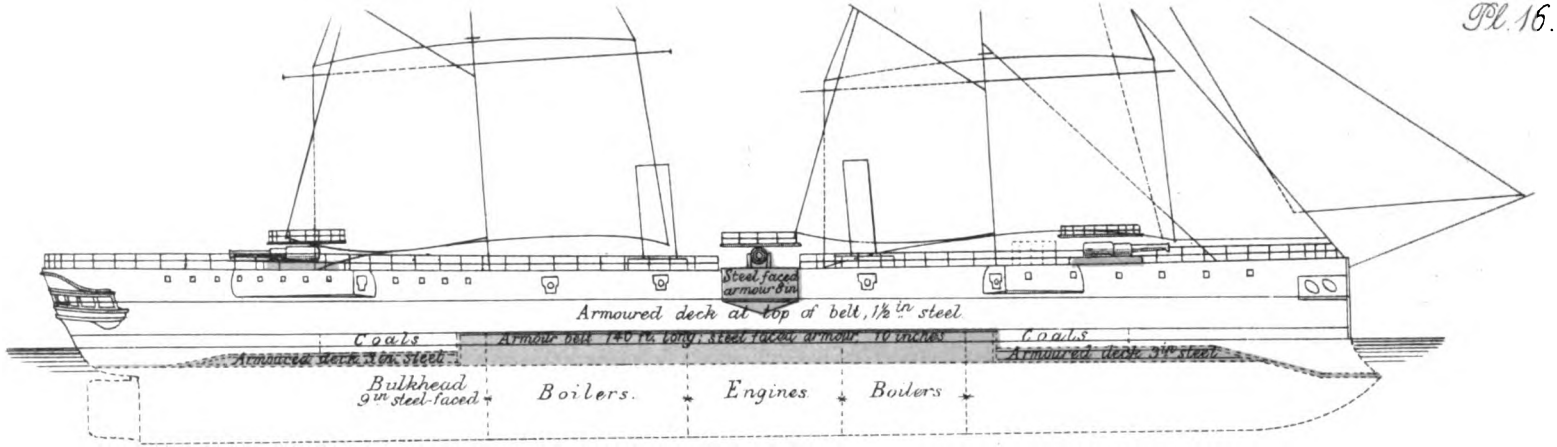
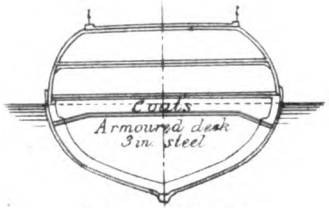
Pl. 16.



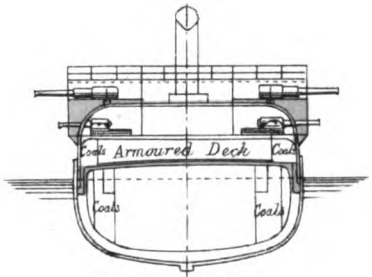
"Imperieuse."

"Warspite."

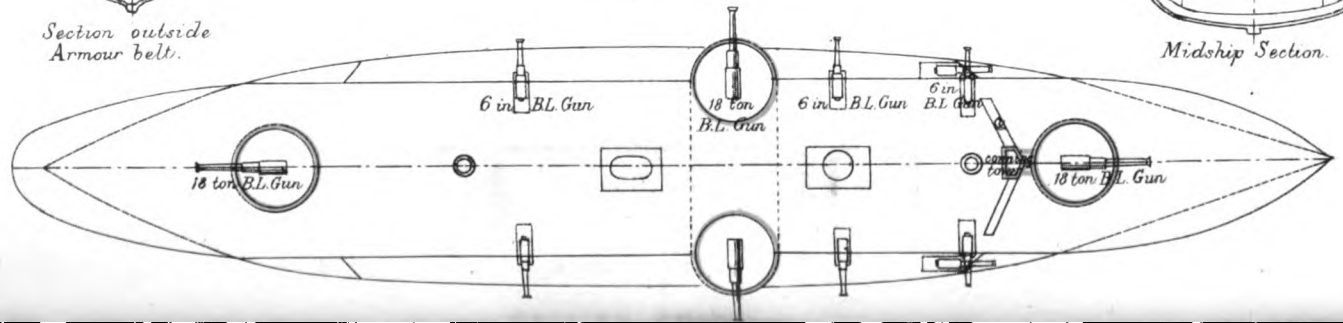
Upper Deck.



Section outside Armour belt.



Midship Section.



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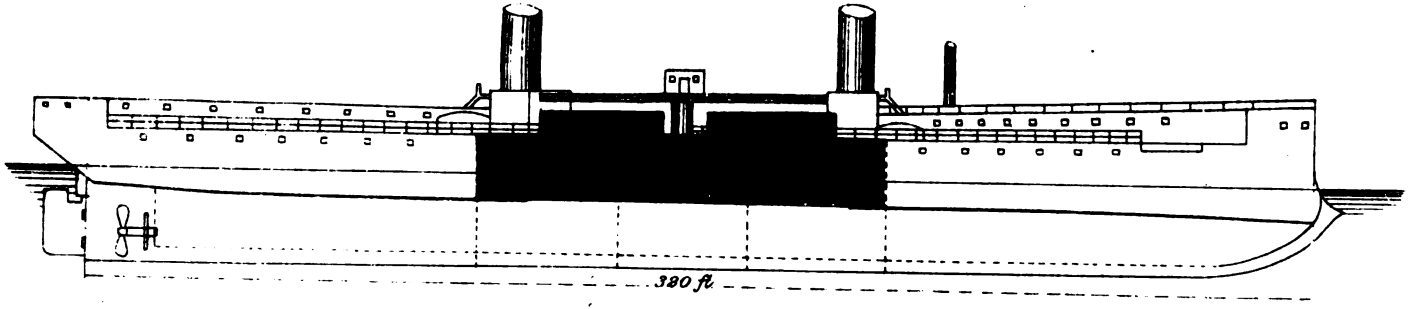
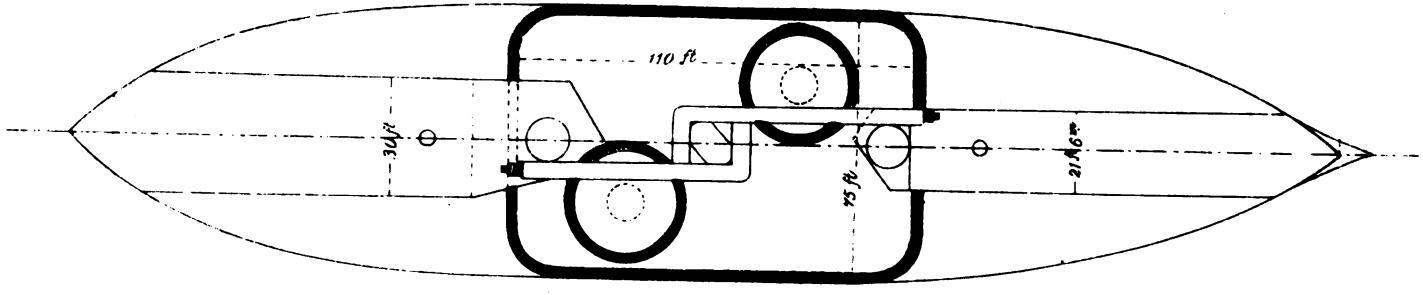
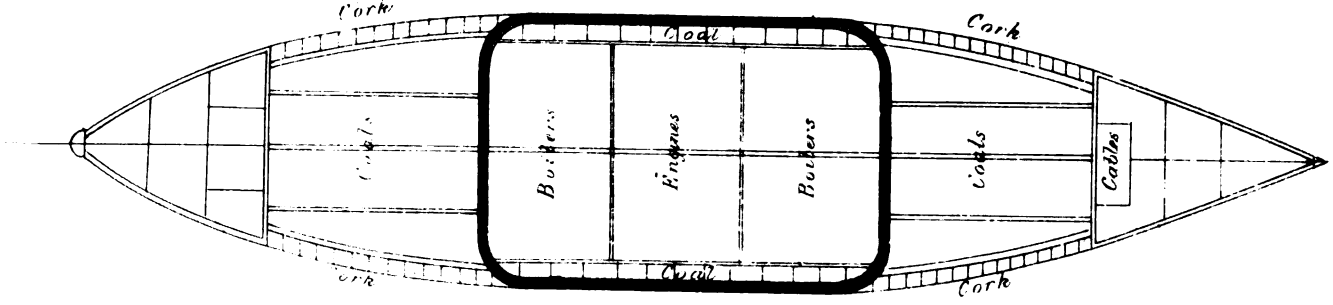
"Inflexible."



Upper Deck



Lower Deck.



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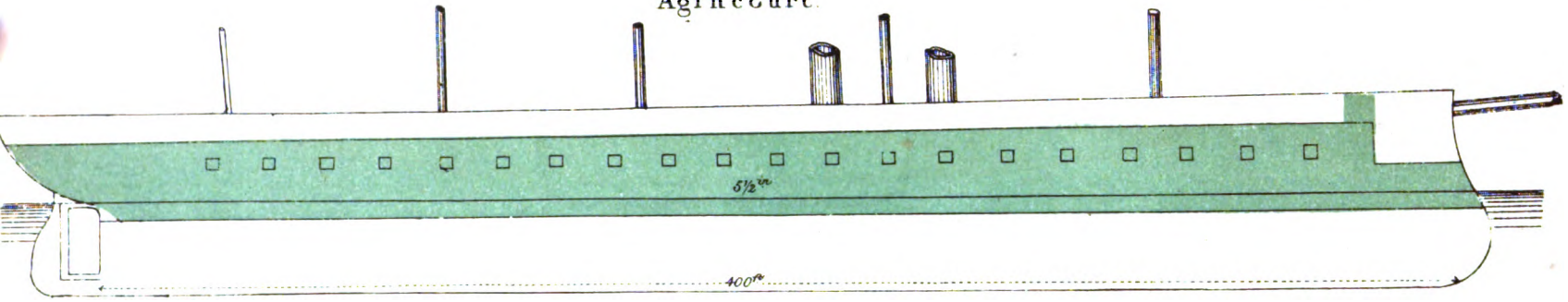
BRITISH SHIPS.

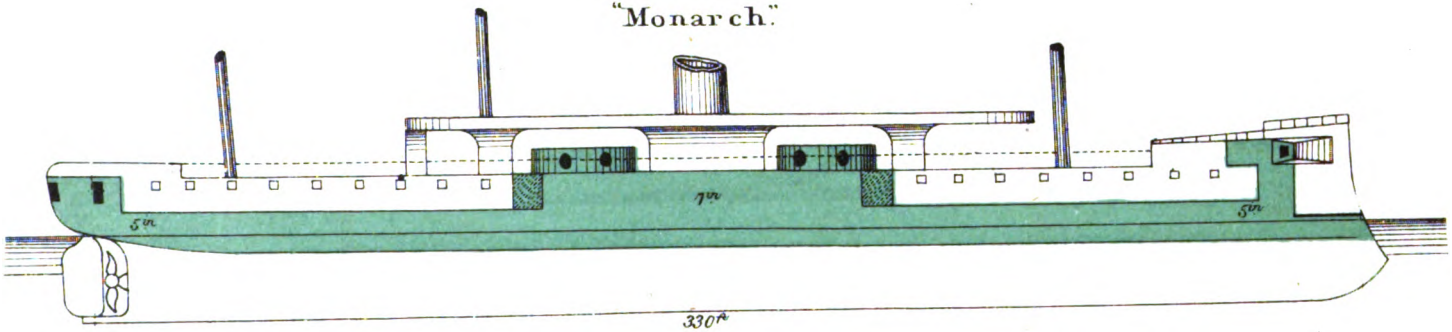
Pl. 18.

"Minotaur."

"Agincourt."



"Monarch."



"Monarch."

Upper Deck.

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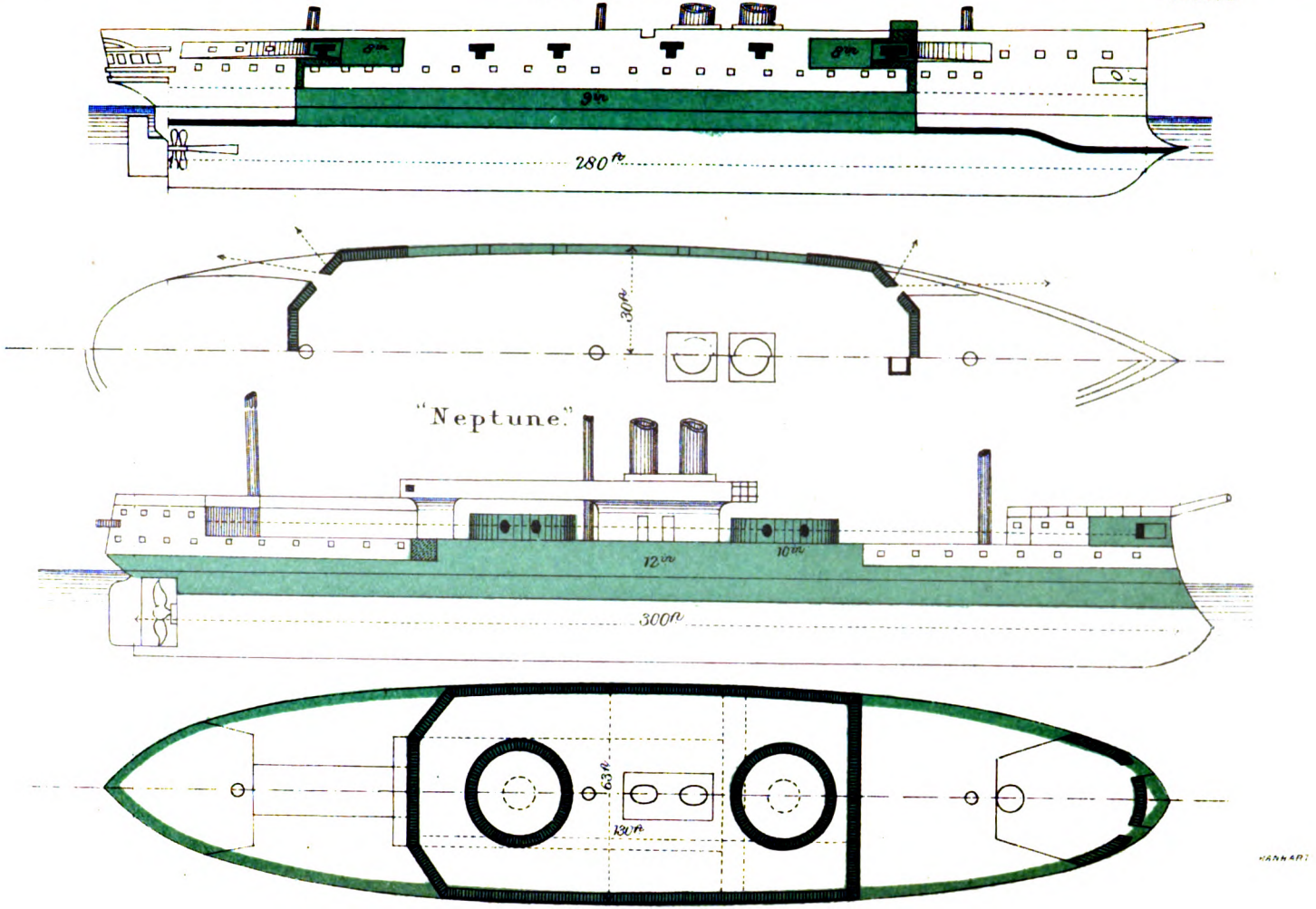

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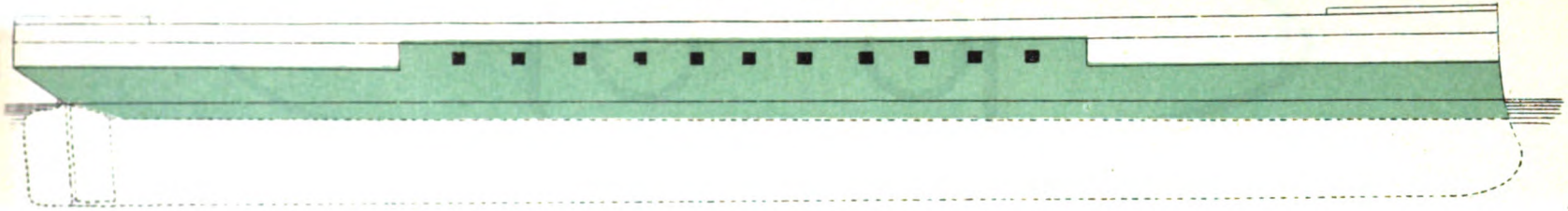
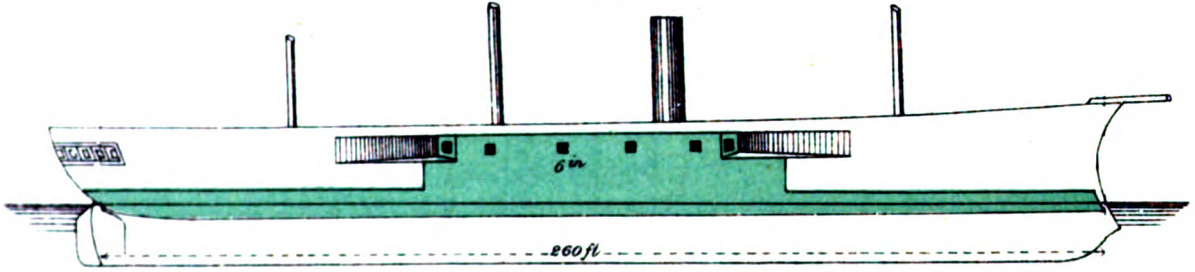
BRITISH SHIPS.

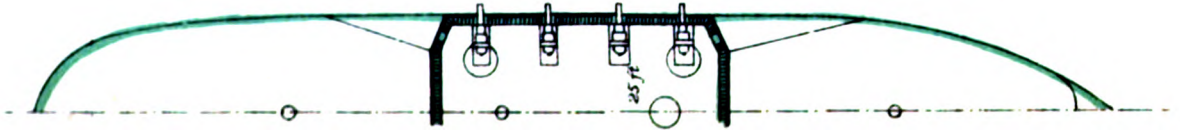
"Northumberland"



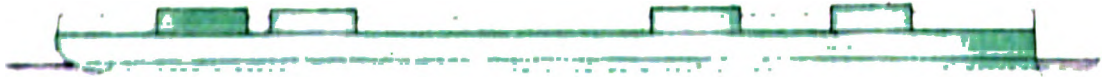
"Penelope"



Main Deck.



"Prince Albert"



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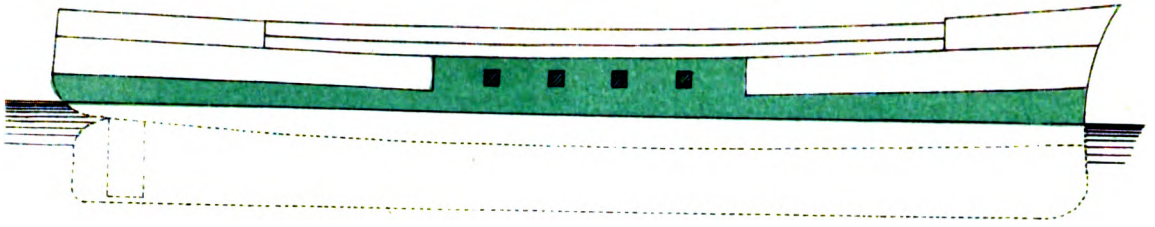
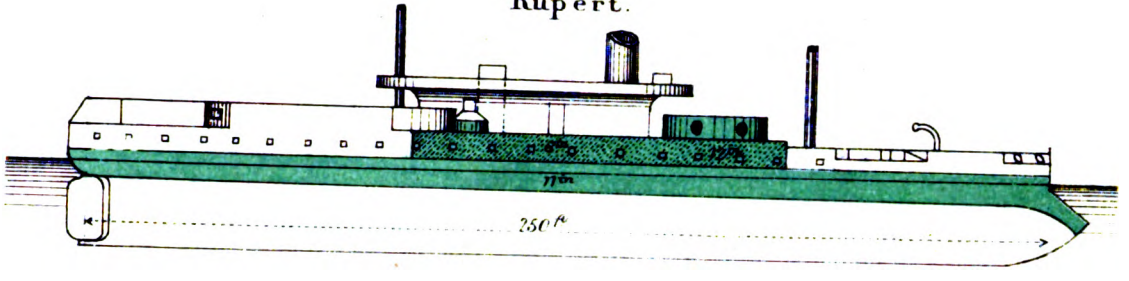
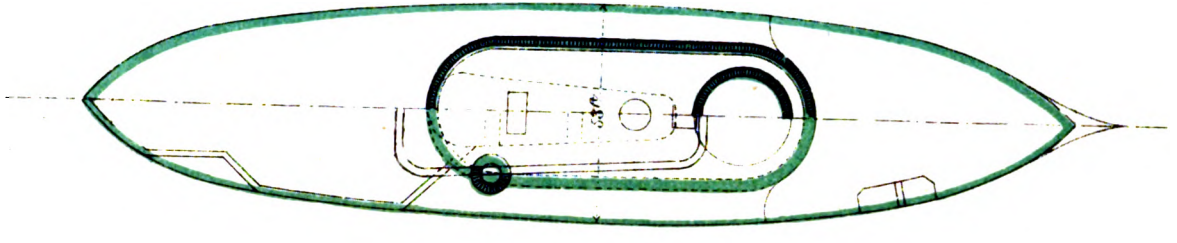
"Repulse."



"Rupert."





Breastwork Deck

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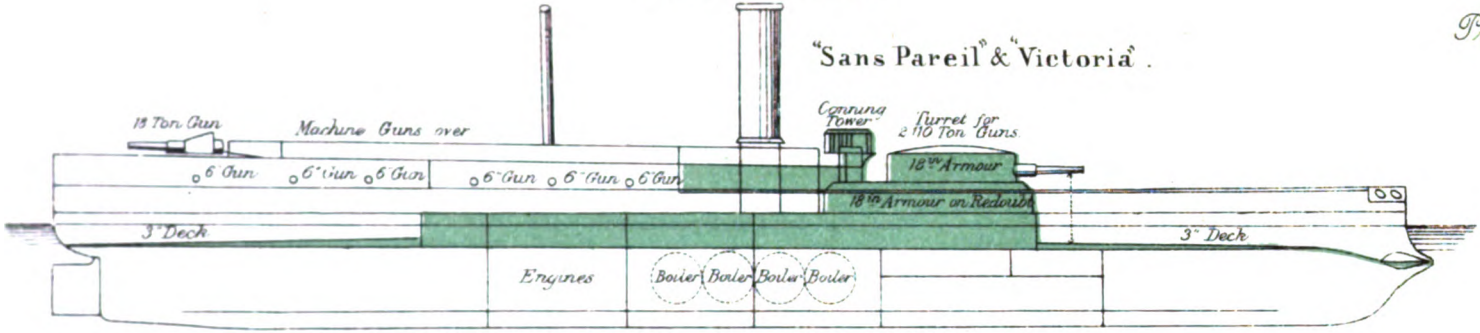
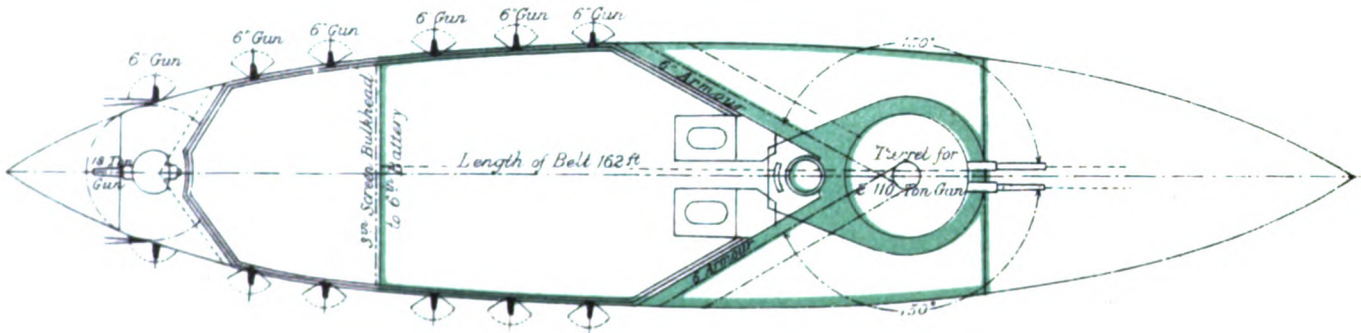
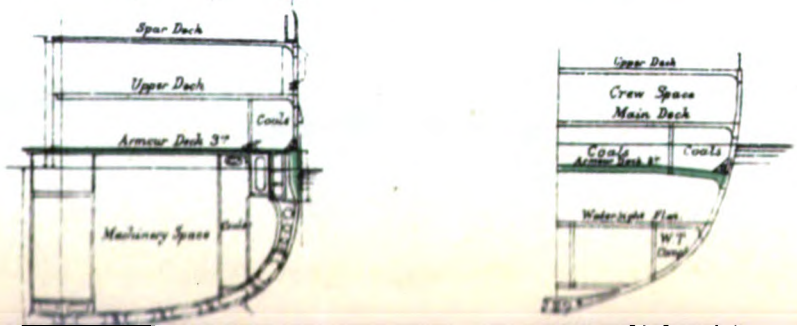
"Sans Pareil" & "Victoria".







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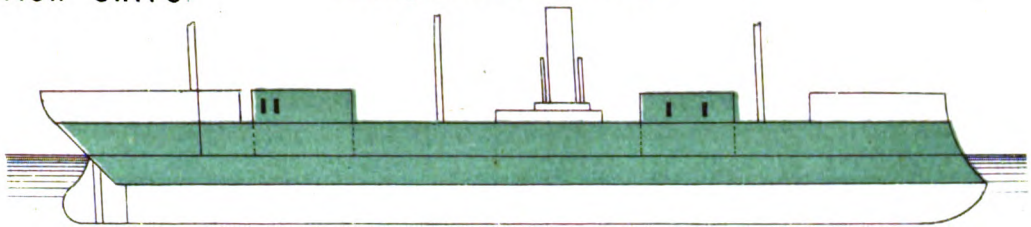
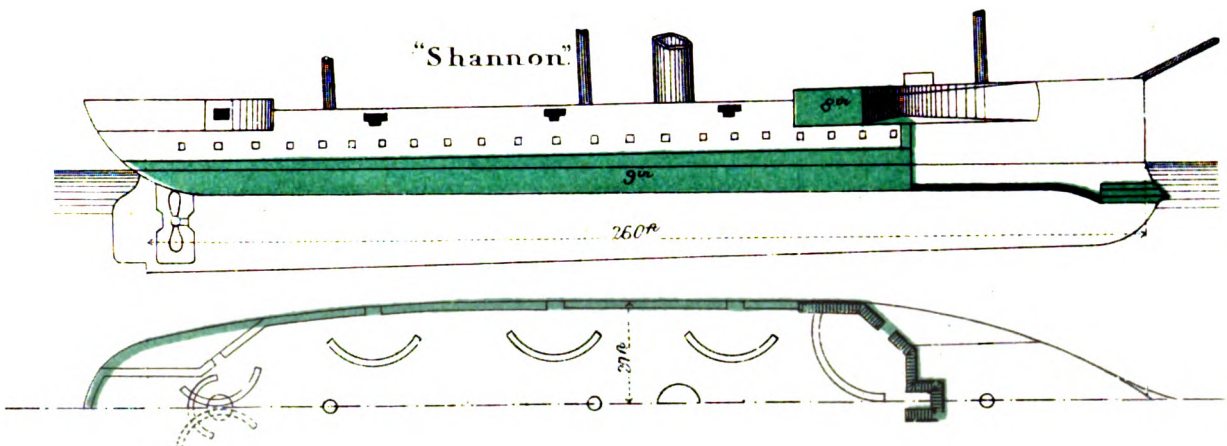
BRITISH SHIPS

"Scorpion" & "Wivern"



"Shannon"



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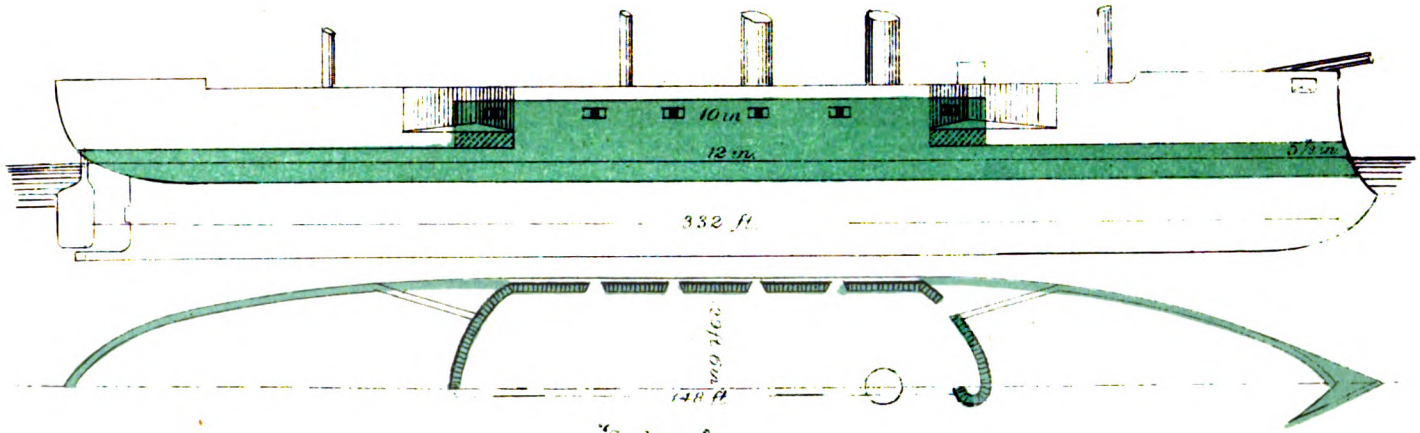
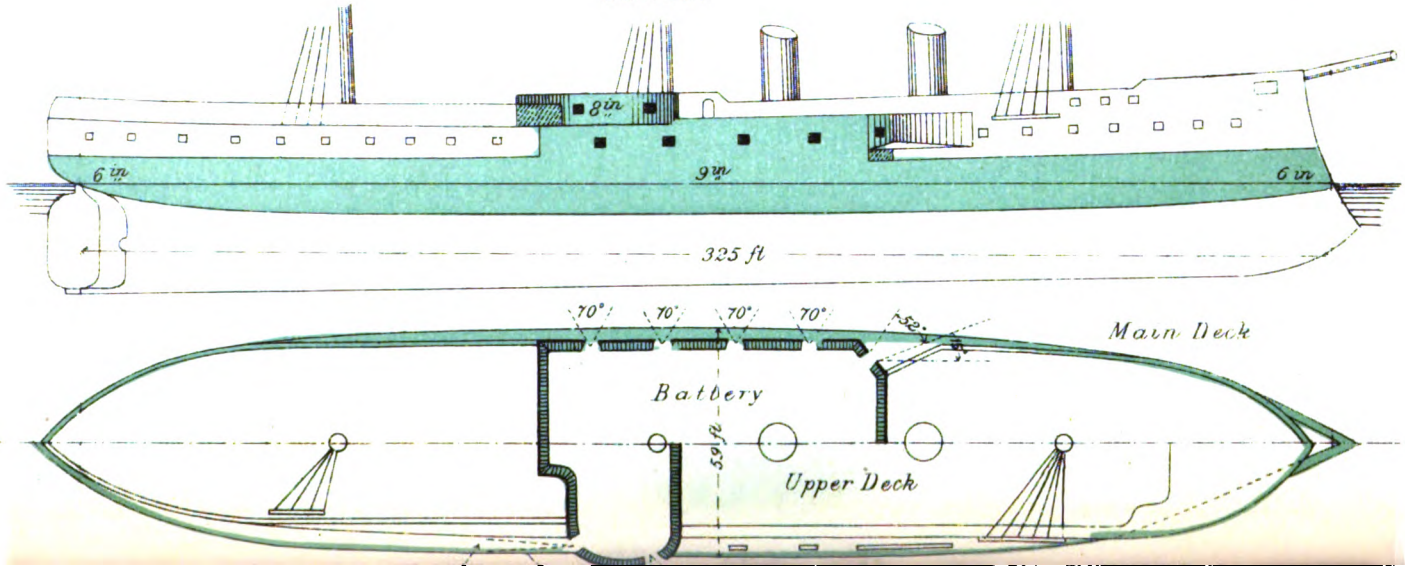
Pl. 24.

"Superb"



"Sultan"



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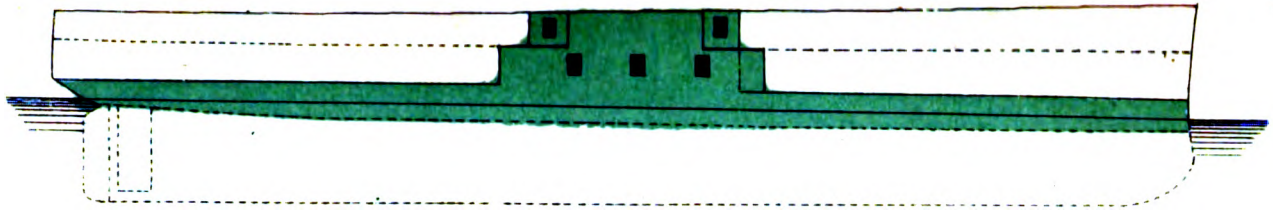
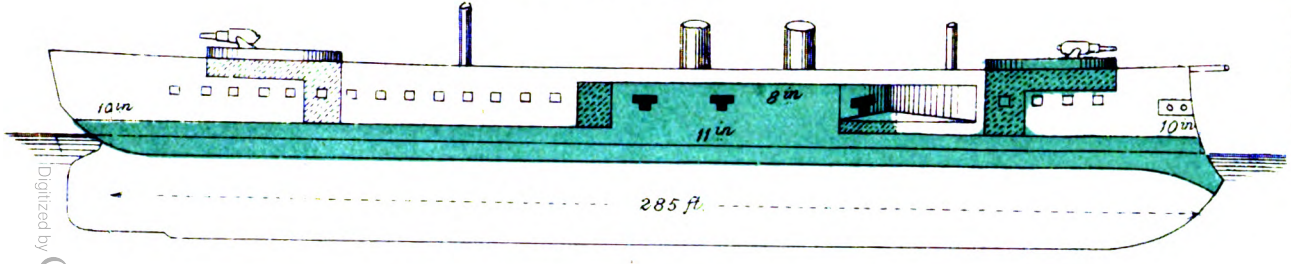
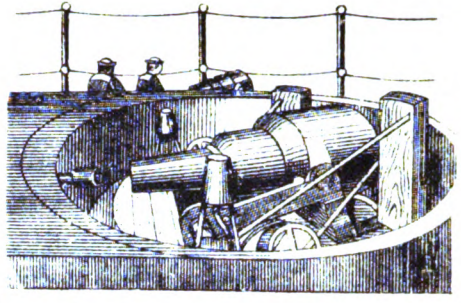


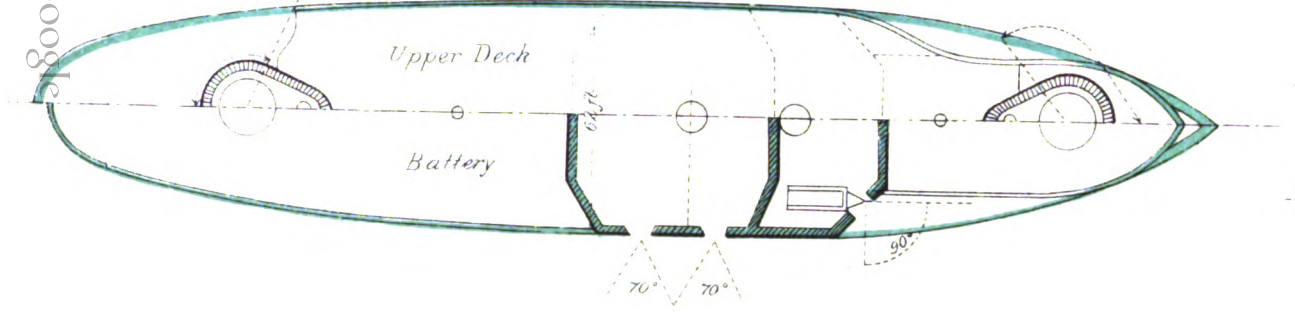
BRITISH SHIPS

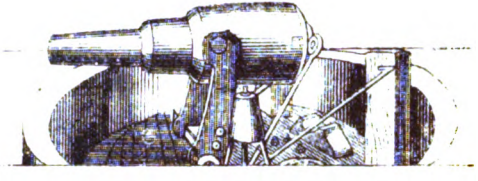
"Téméraire."





Téméraire's Gun,
loading position.





Téméraire's Gun,
firing position.

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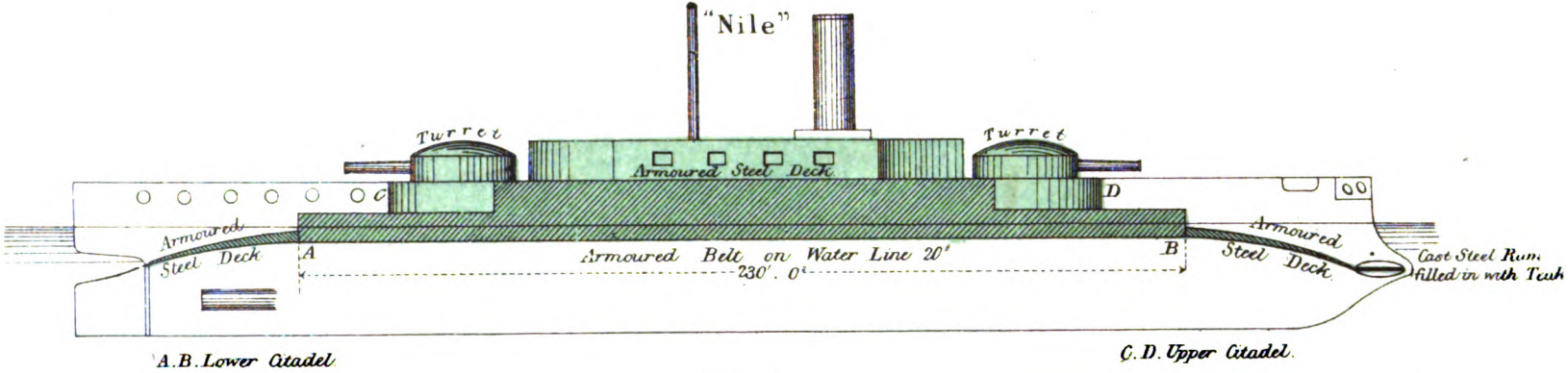
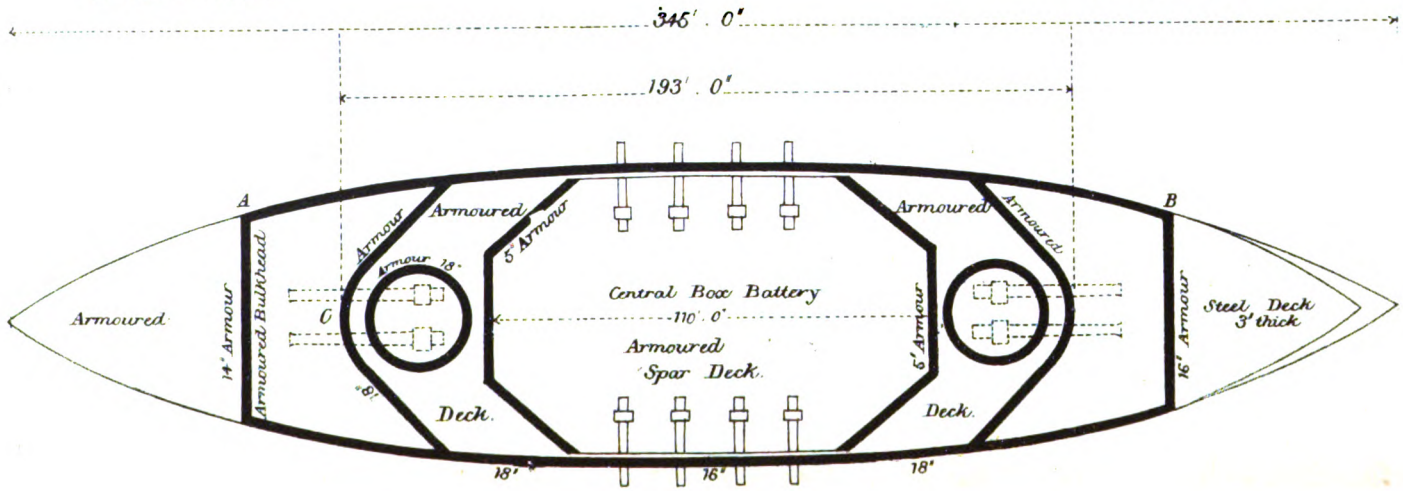
"Trafalgar"

"Nile"





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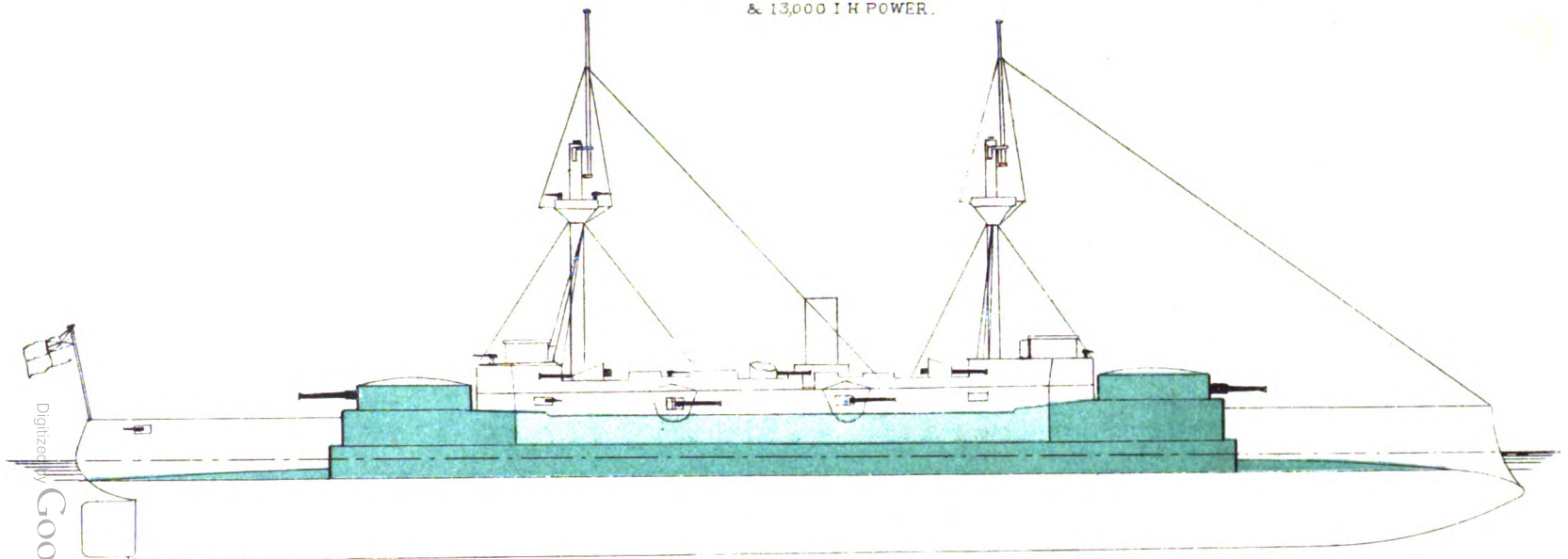
HANHART LITH

New Battle Ship, (Turret with Redoubts) Design, 1889.

of 14,150 TONS DISPLACEMENT.
& 13,000 I.H.POWER.



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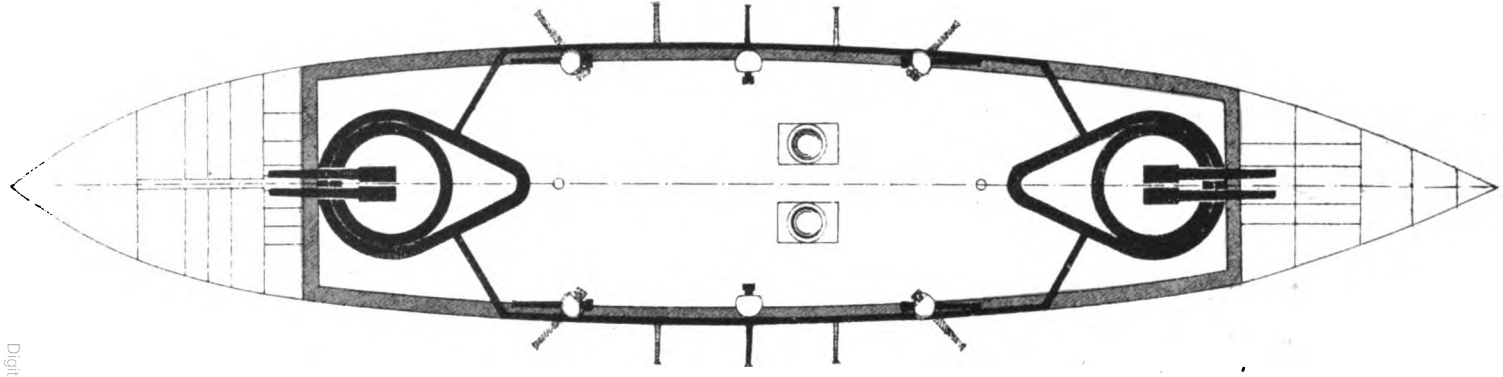
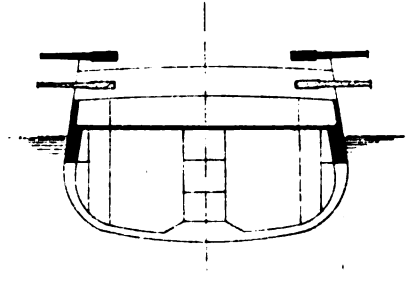
HANHART LITH





On Special Scale.

NEW TURRET SHIP
DESIGN

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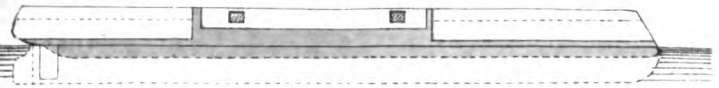
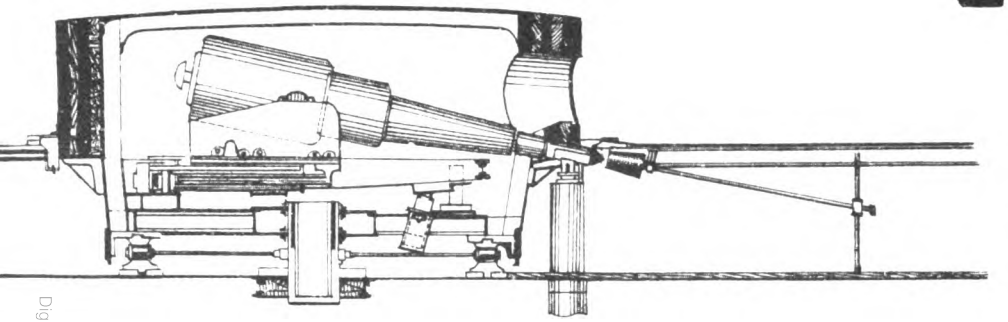
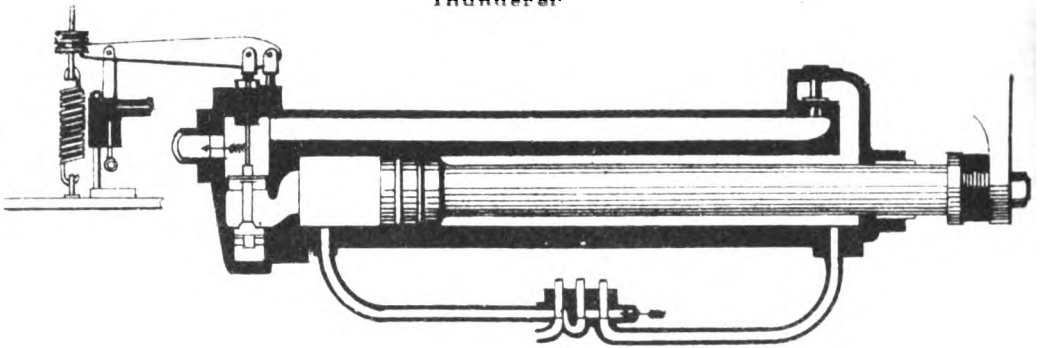
"Vixen" & "Viper".



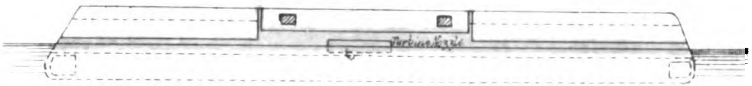
Thunderer.



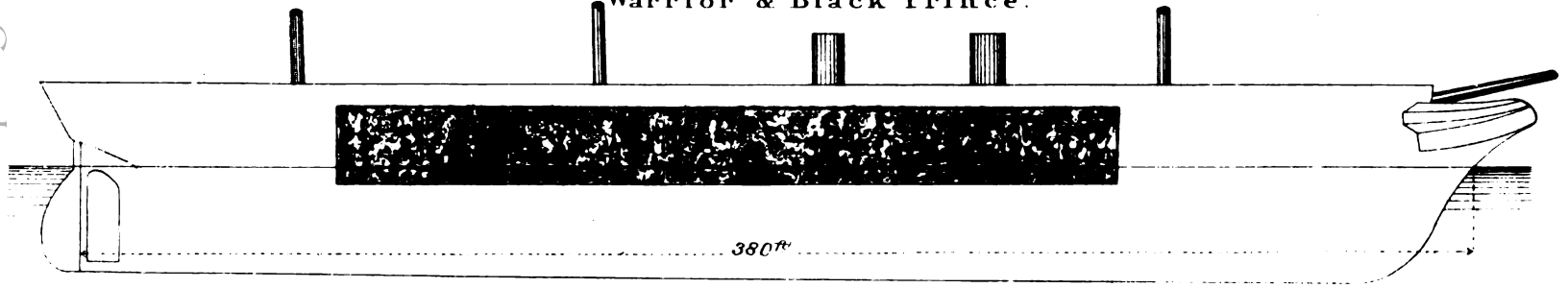
Thunderer



"Waterwitch".



"Warrior" & "Black Prince".



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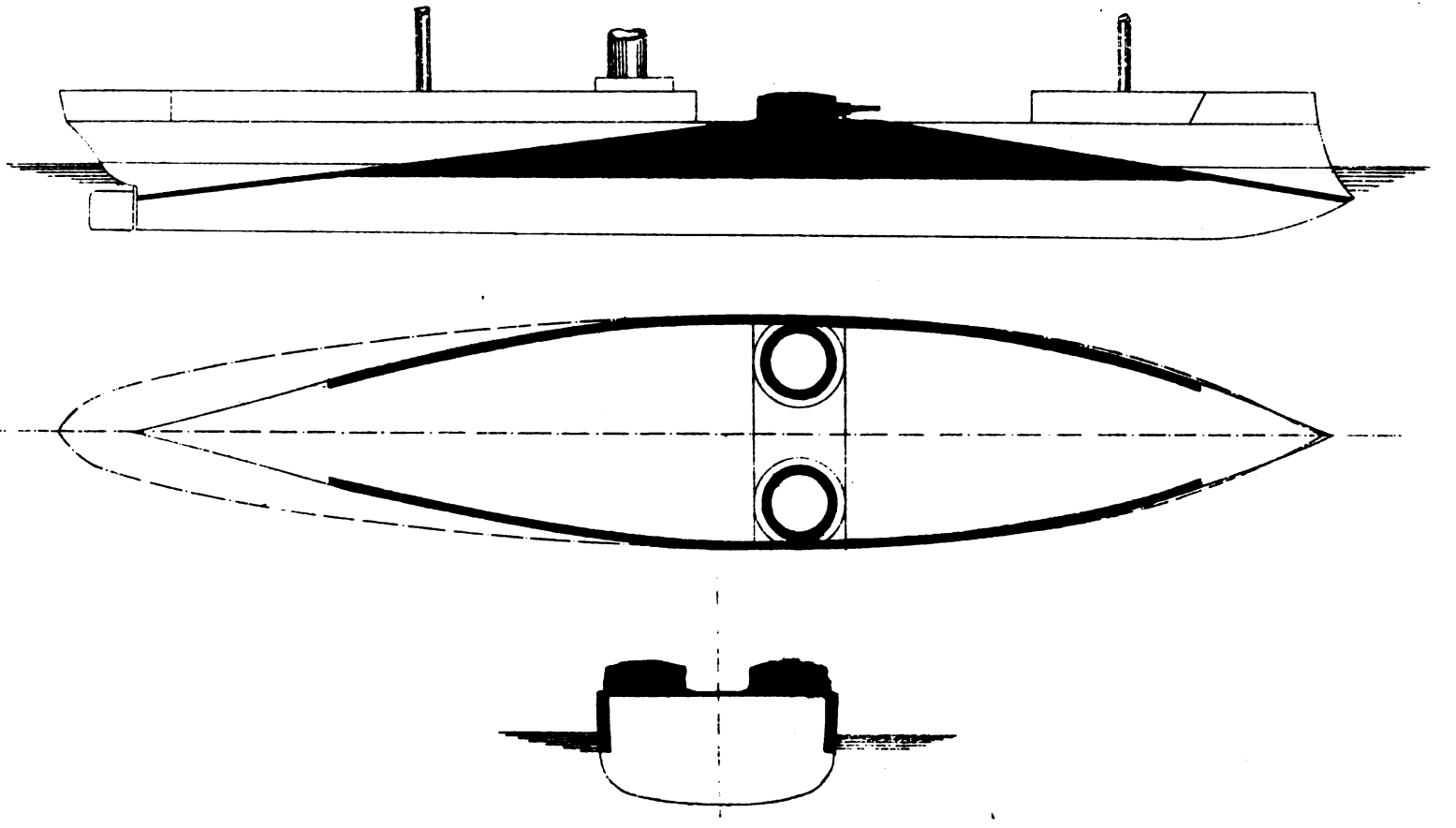

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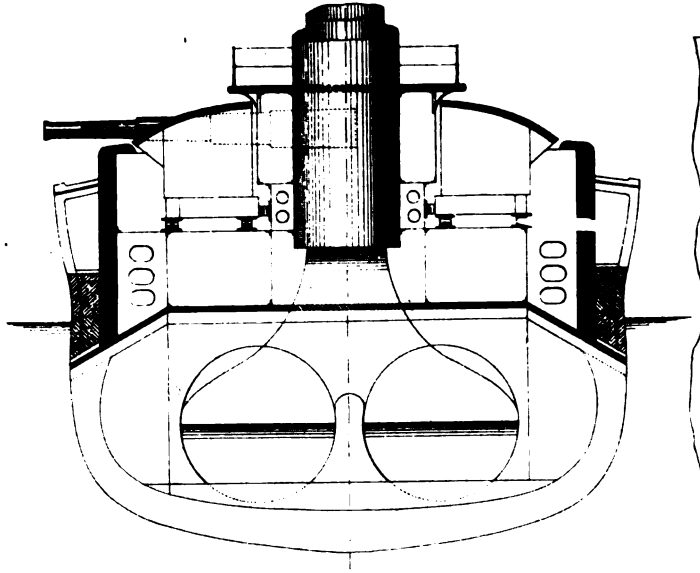
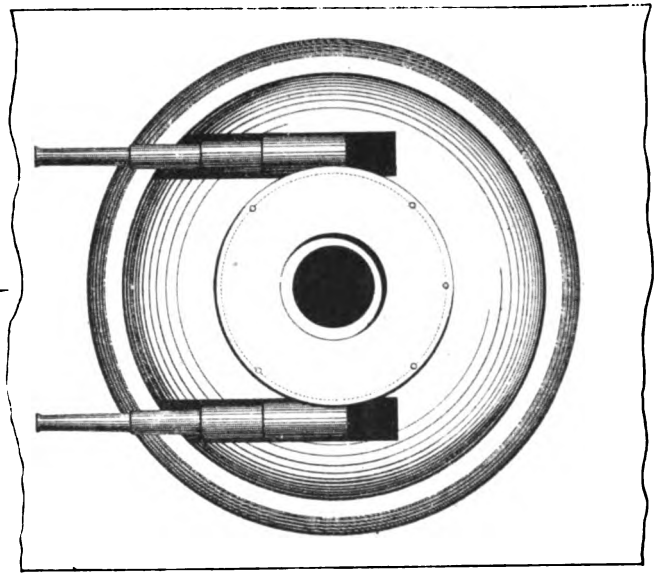
SIR. N. BARNABY'S PATENT.

On Special Scale.





The portion below the protective deck has been added to the sketch in patent specification for the purposes of the diagram.

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ASTOR, LENOX AND
TILDEN FOUNDATIONS
R L

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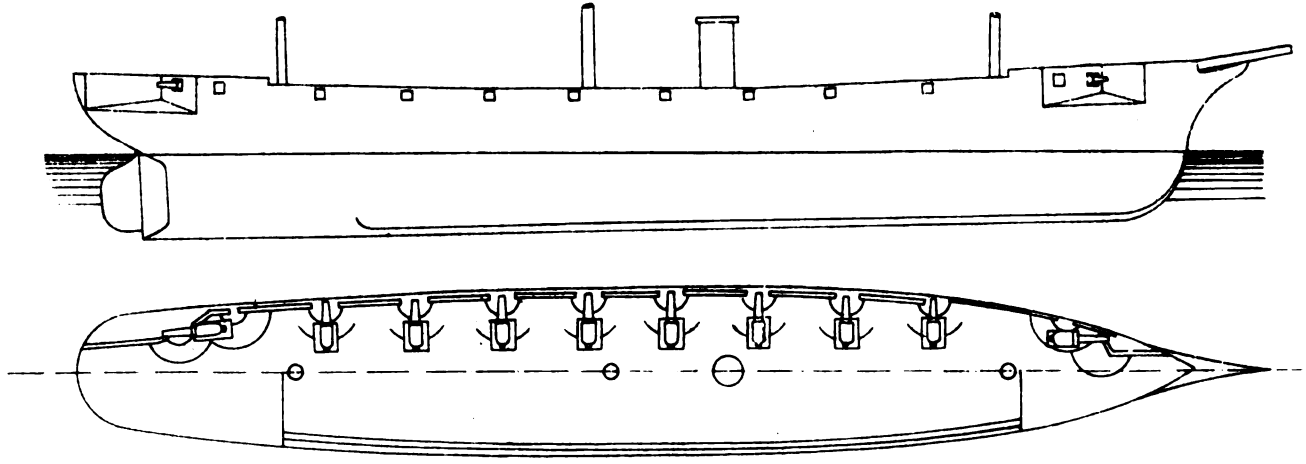
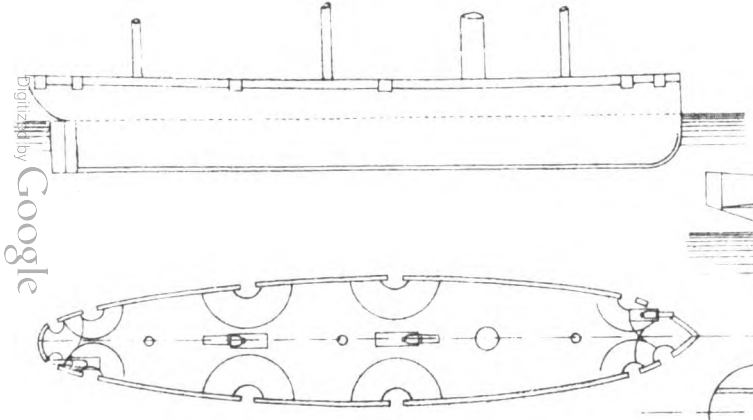
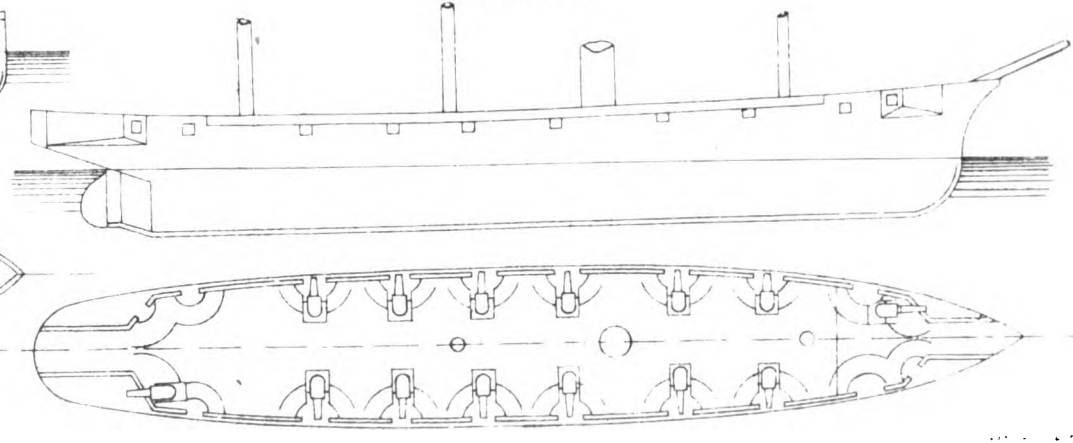


"Albatross."

"Amethyst"
"Modeste"
"Diamond"





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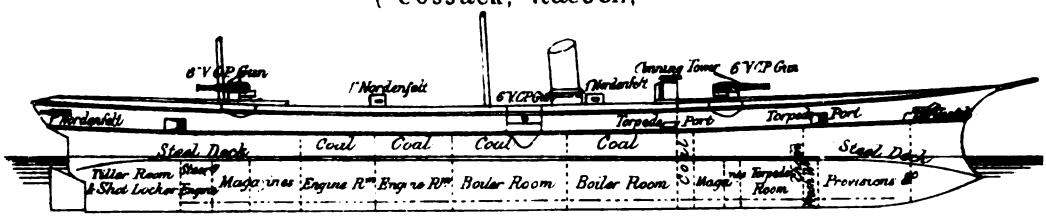
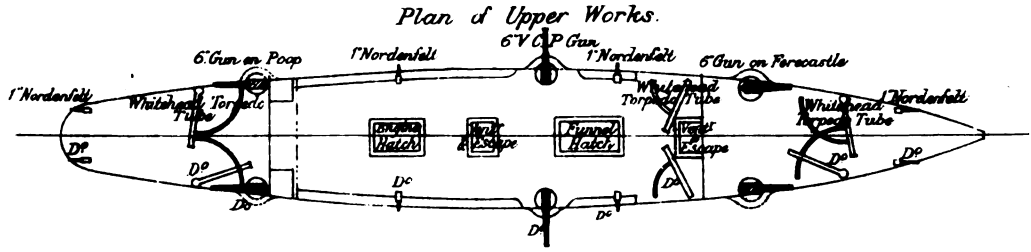
BRITISH SHIPS

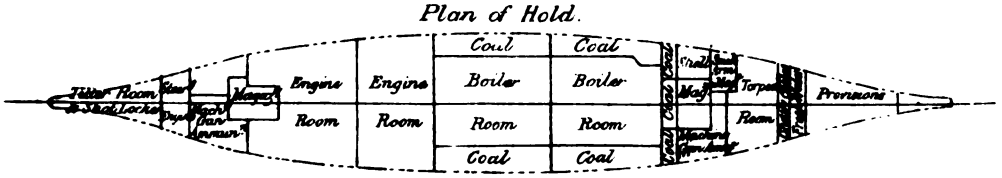
Vessels of "Archer" class { "Archer", "Brisk", "Cossack", "Mohawk", "Porpoise", "Racoon", "Serpent", "Tartar"



Plan of Upper Works.



Plan of Hold.



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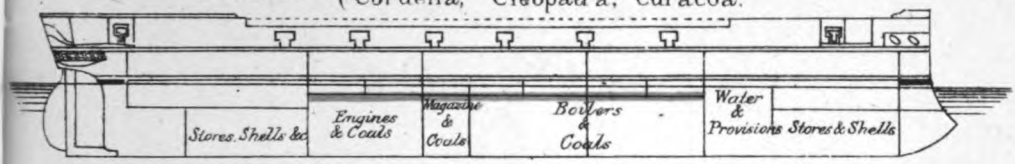
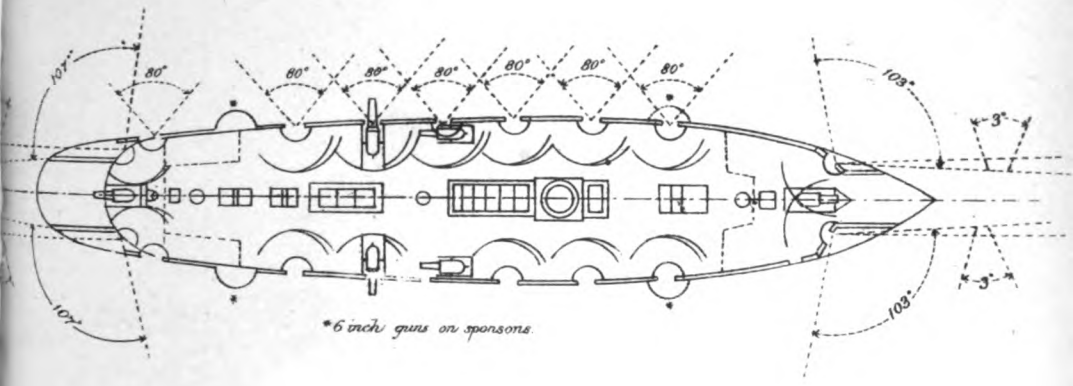
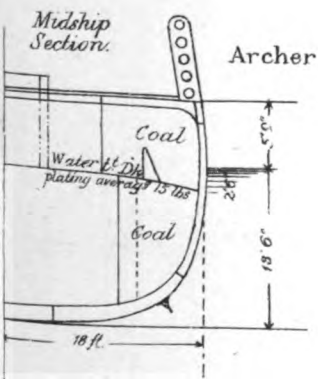
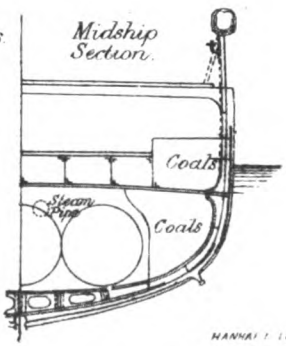
Vessels of "Comus" class. {"Canada", "Carysfort", "Comus", "Constance", "Champion", "Conquest", "Cordelia", "Cleopatra", "Curacoa".}





*6 inch guns on sponsons.





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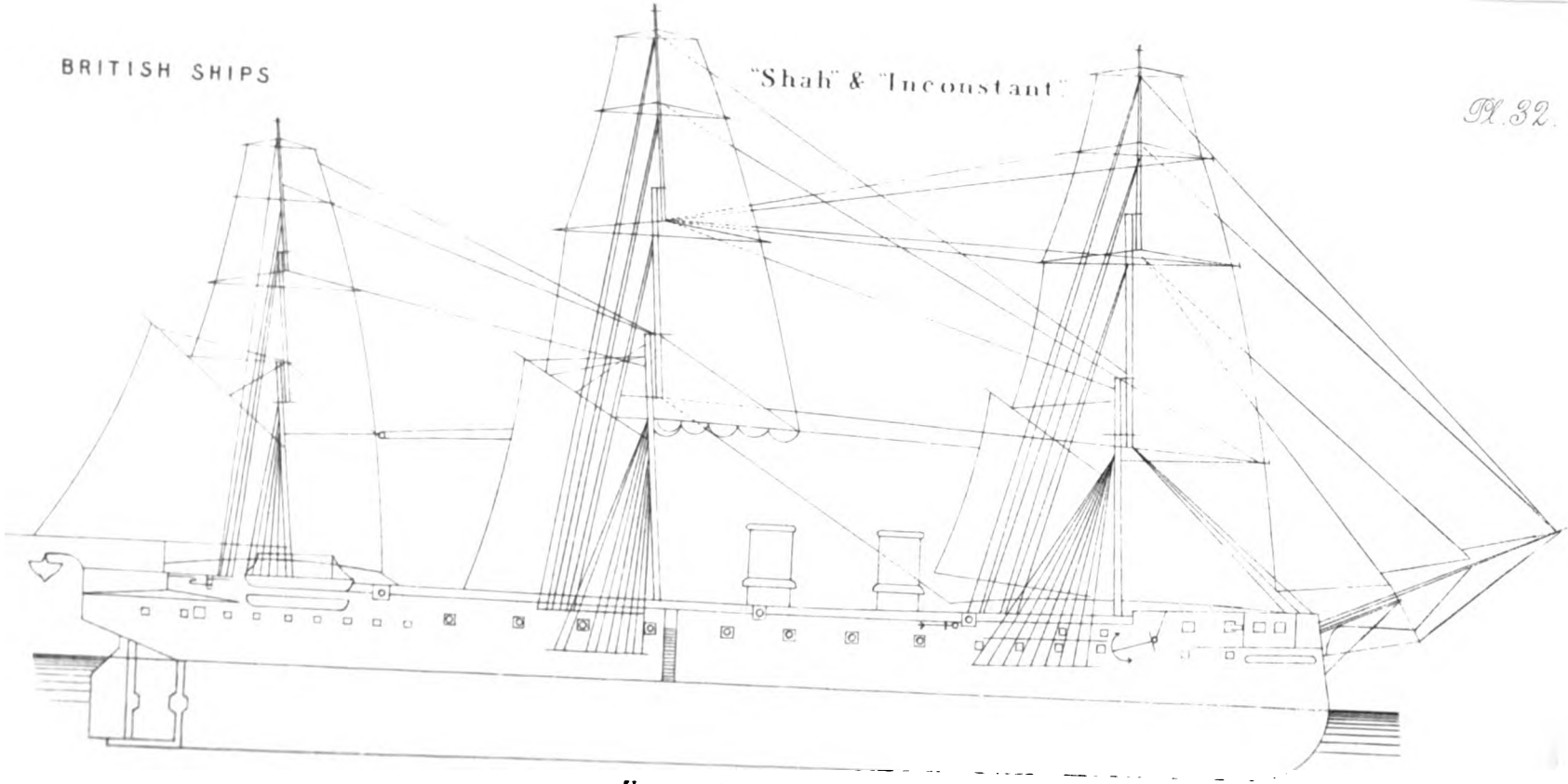
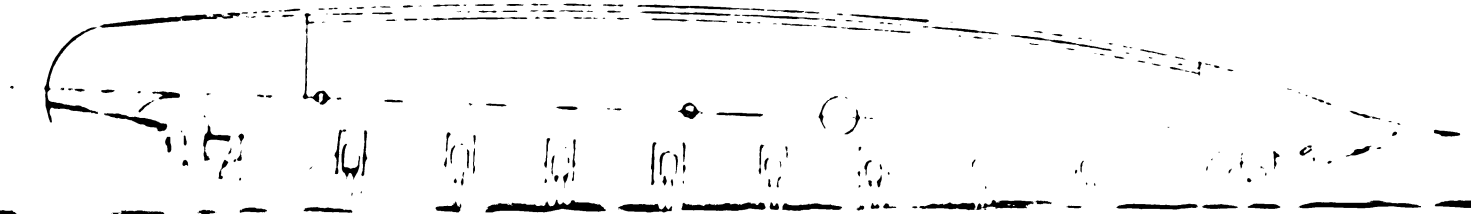
BRITISH SHIPS

"Shah" & "Inconstant"

Pl. 32.



Upper Deck



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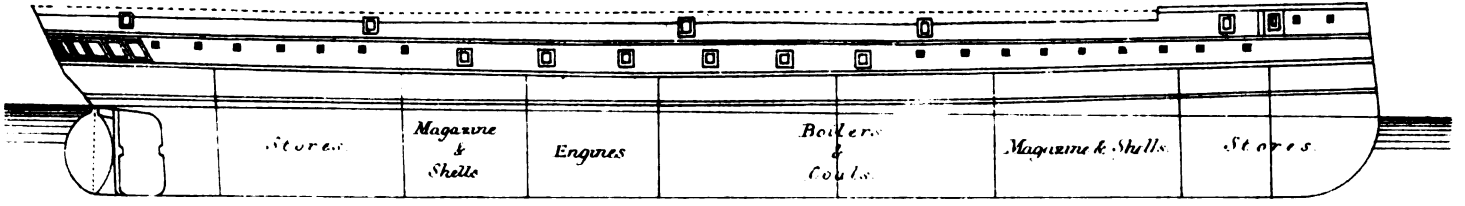
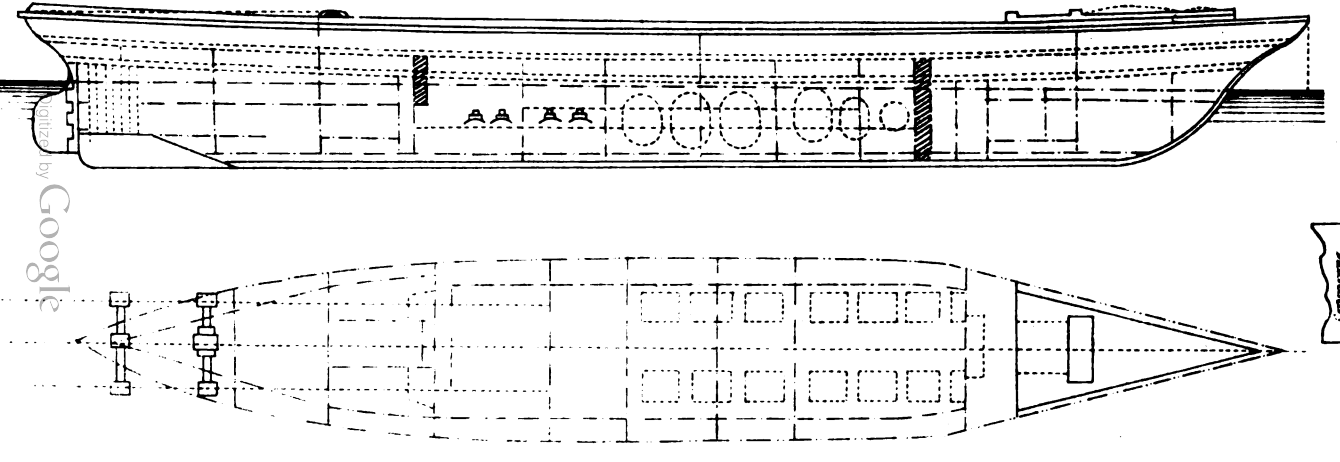
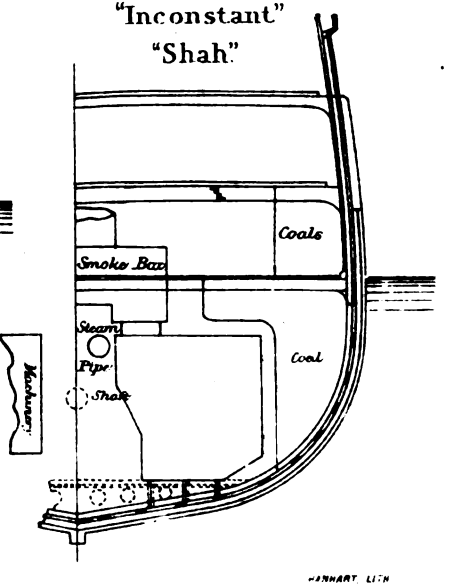
"Inconstant" & "Shah."



"Iris" & "Mercury."



"Inconstant"
"Shah."



HANHART LITH

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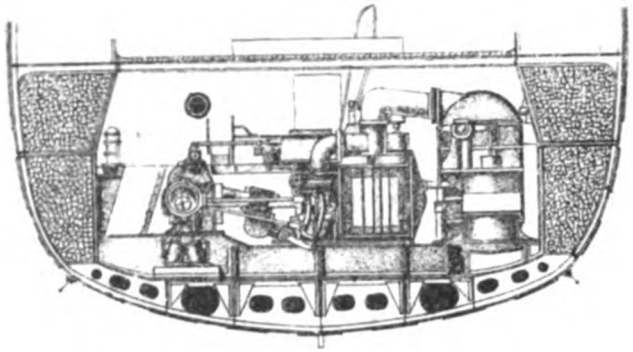
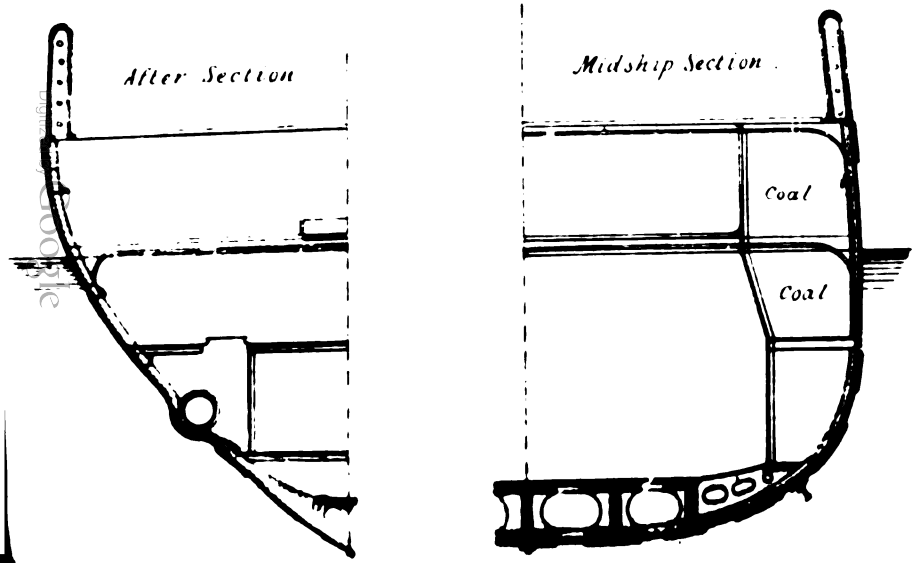
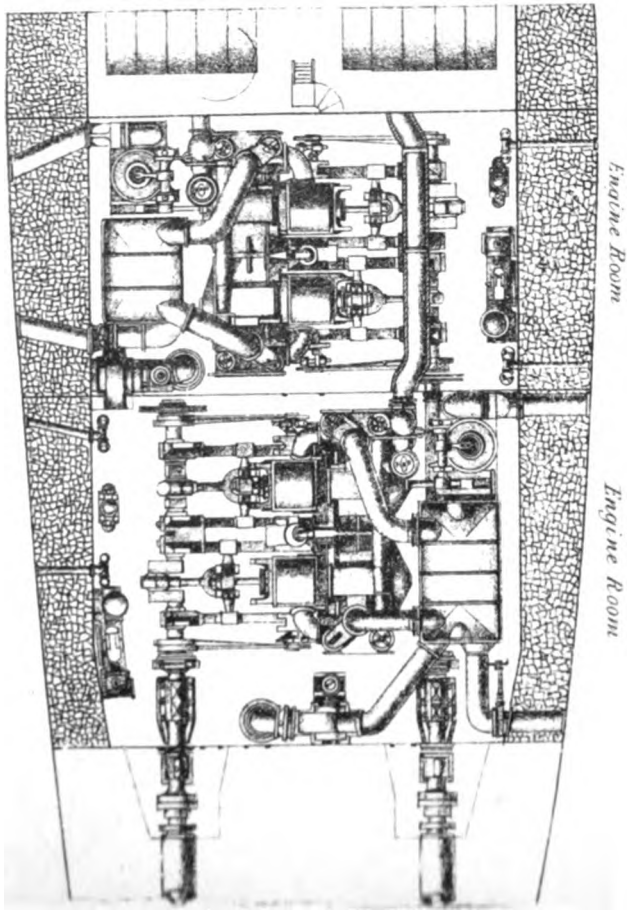


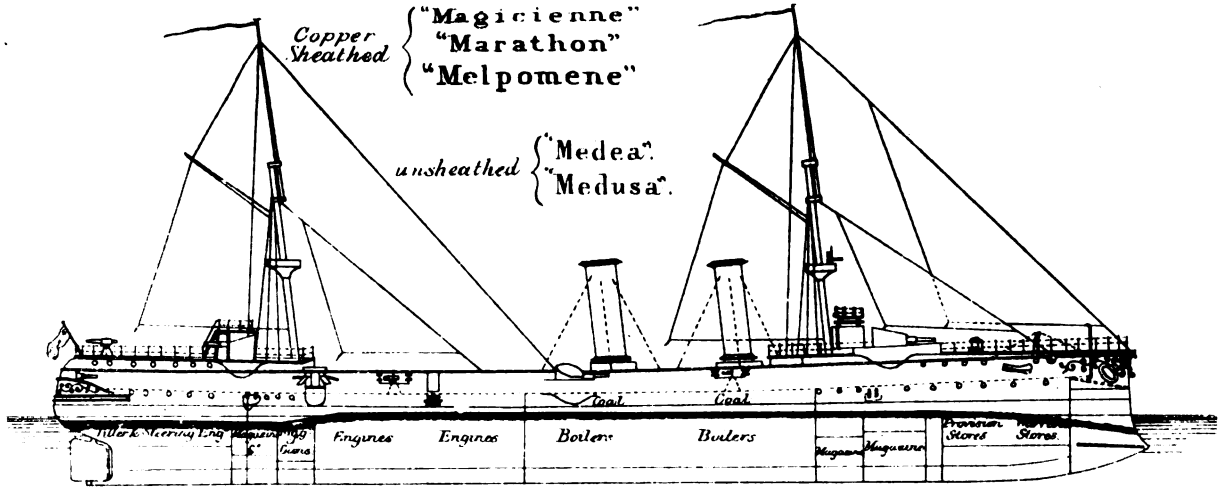

After Section
Midship Section
Coal
Coal


Engine Room
Engine Room

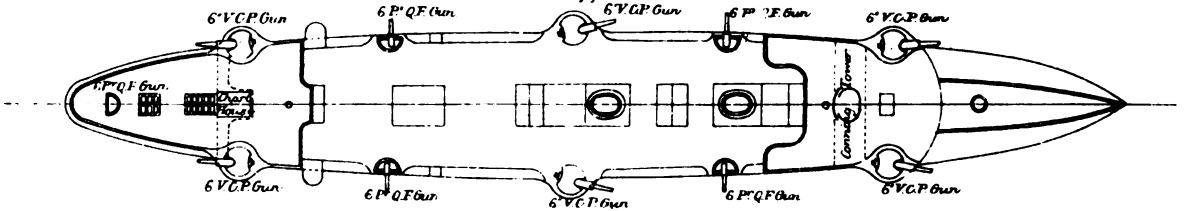
Wood Sheathed Protected Cruisers.

Copper Sheathed { "Magicienne" "Marathon" "Melpomene"

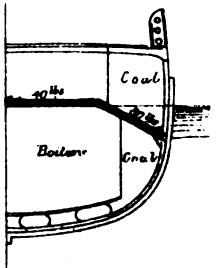
unsheathed { "Medea" "Medusa".



Plan of Upper Works.



Midship Section.



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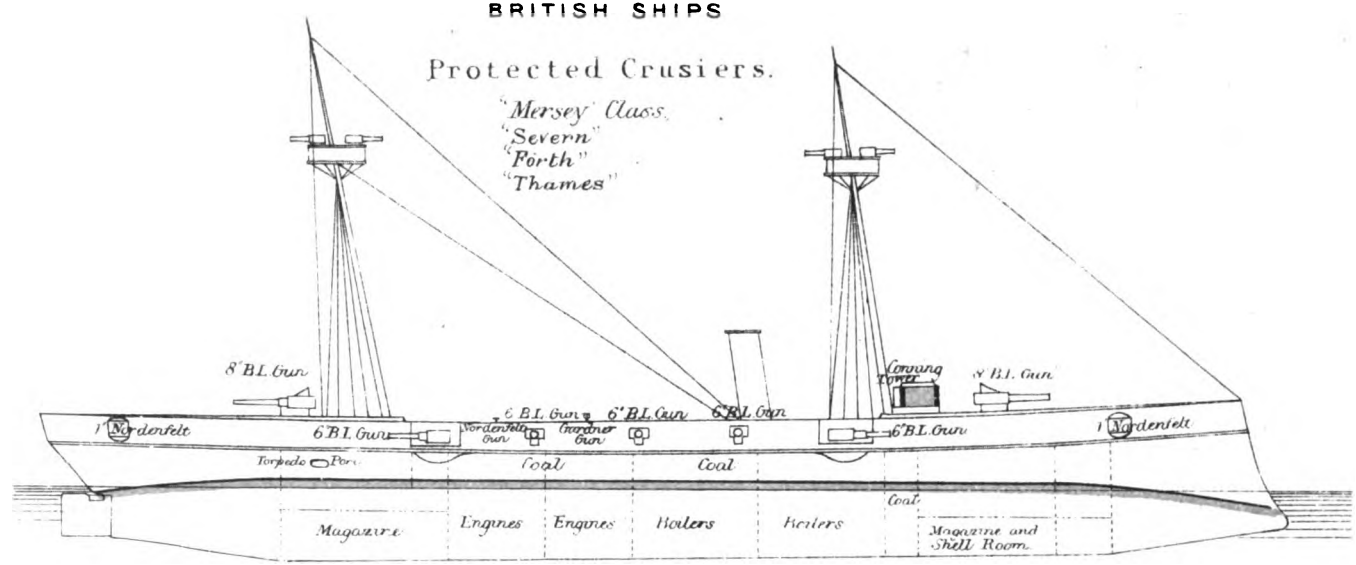
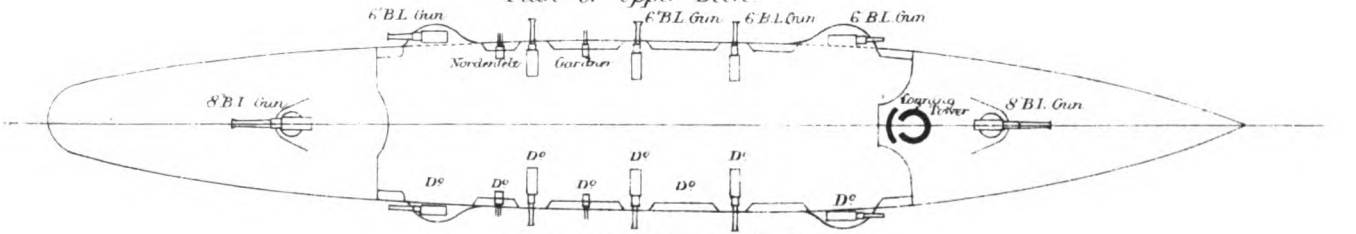
Protected Cruisers.

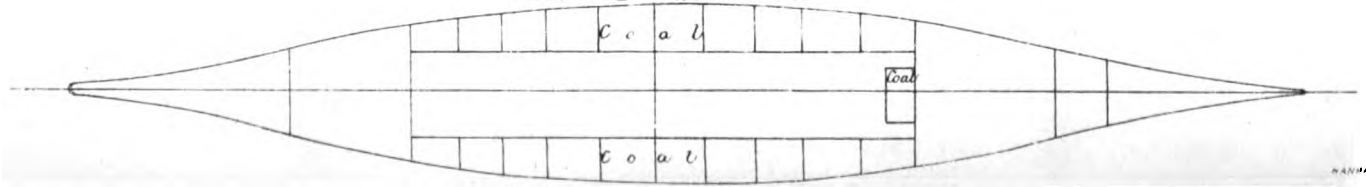
"Mersey" Class.
"Severn"
"Forth"
"Thames"



Plan of Upper Deck



Plan of Protective Deck



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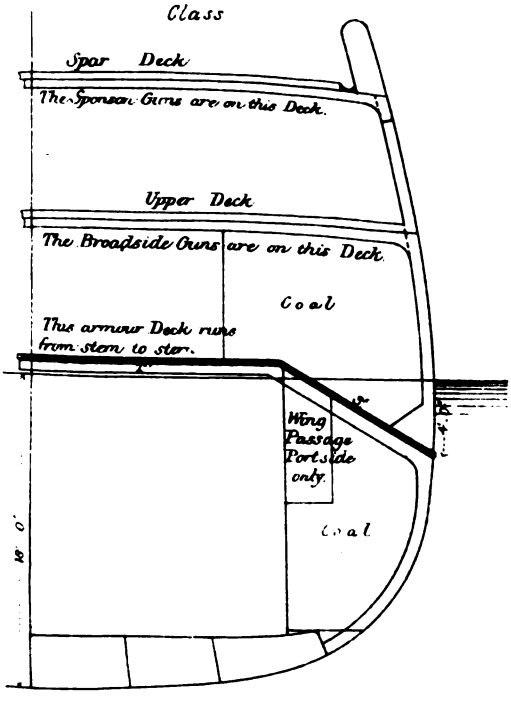
Pl. 37.

Midship Section of

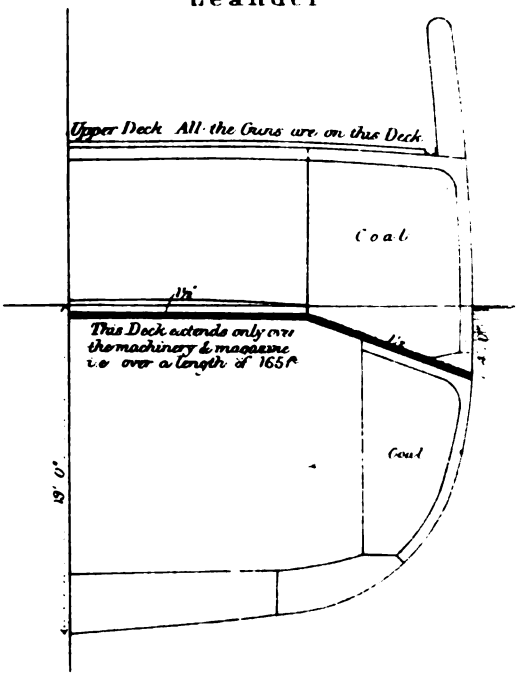
"Mersey"

Class



Midship Section of

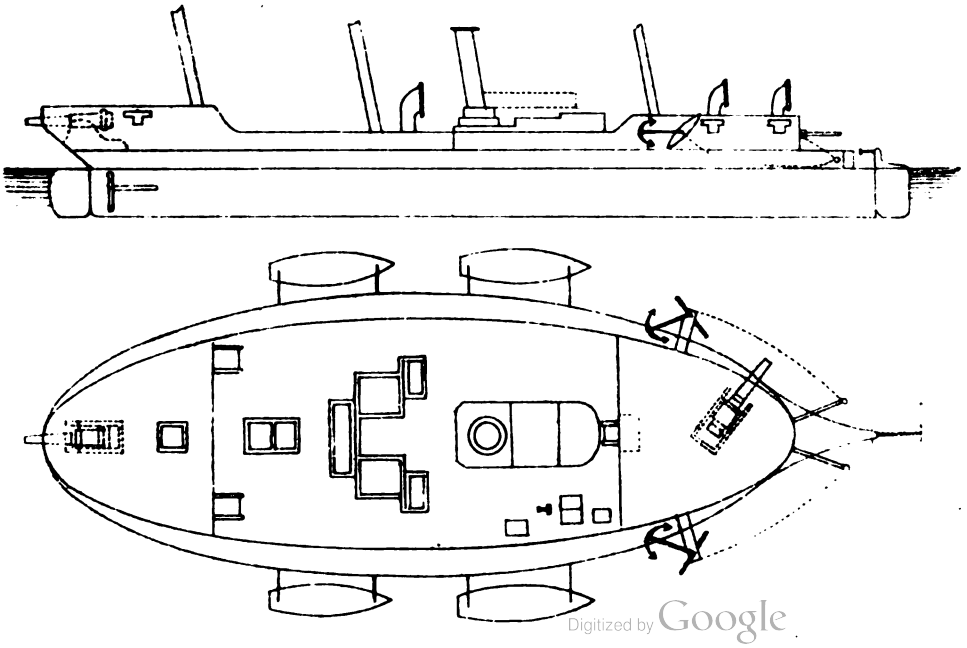
"Leander"


Upper Deck All the Guns are on this Deck.
Coal
This Deck extends only over the machinery & magazine i.e. over a length of 165ft
Coal
18' 0"

BRITISH SHIPS.

"Medina" *class.*

(On special Scale)



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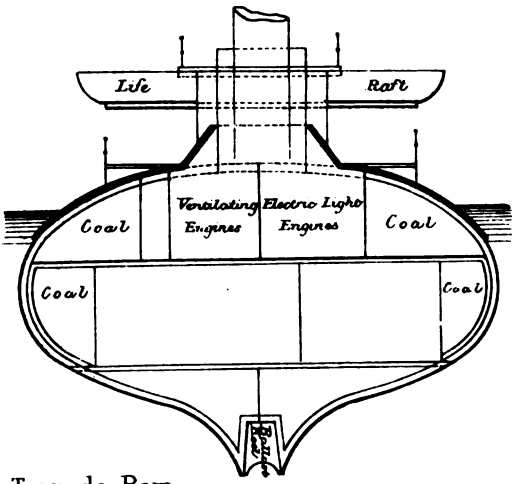
BRITISH SHIPS.

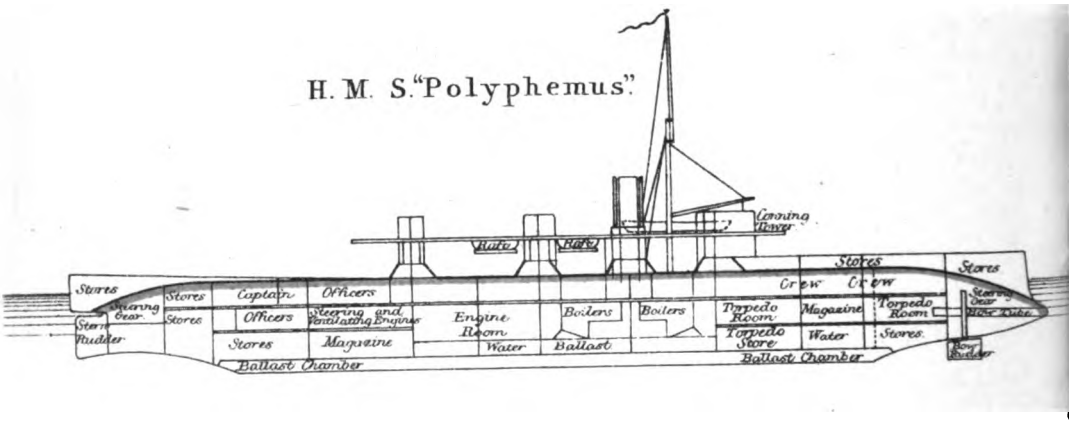
"Polyphemus".

Midship Section.

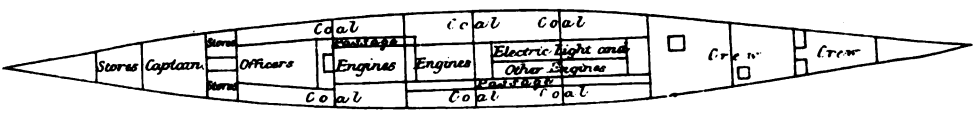


Protected Torpedo Ram.

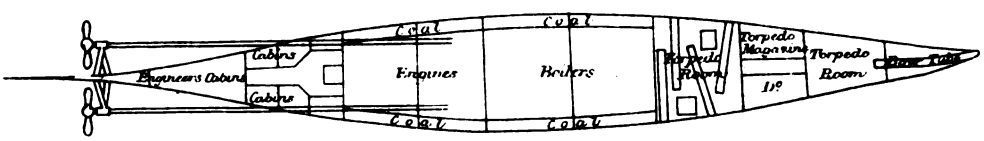
H. M. S. "Polyphemus".



Main Deck.



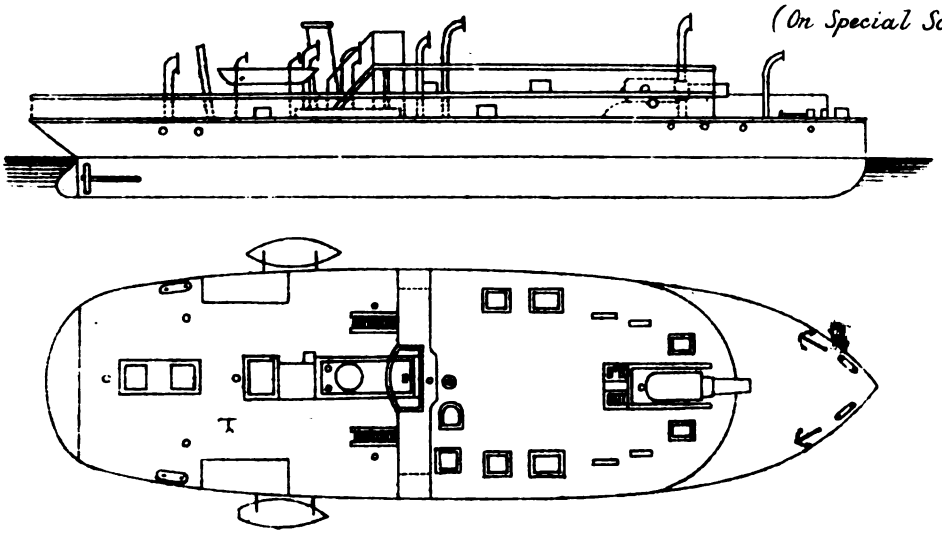
Lower Deck.



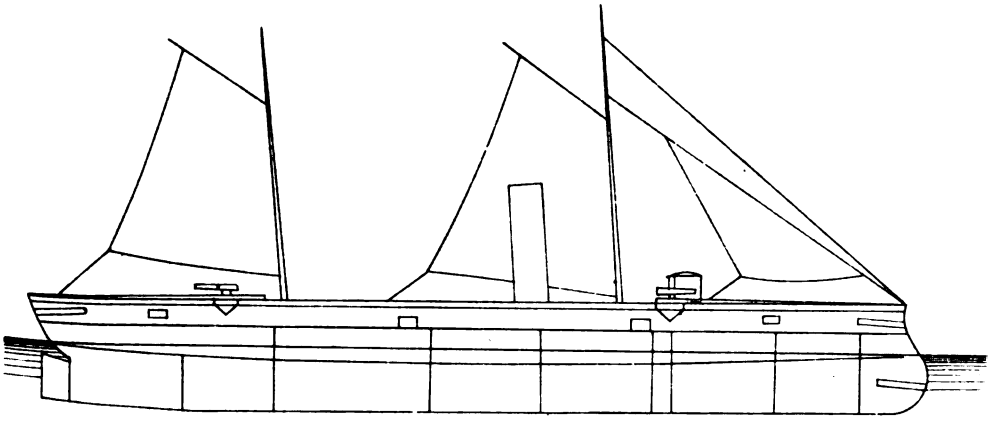
Digitized by Google

"Staunch," *class*

(On Special Scale)



"Scout" & "Fearless"



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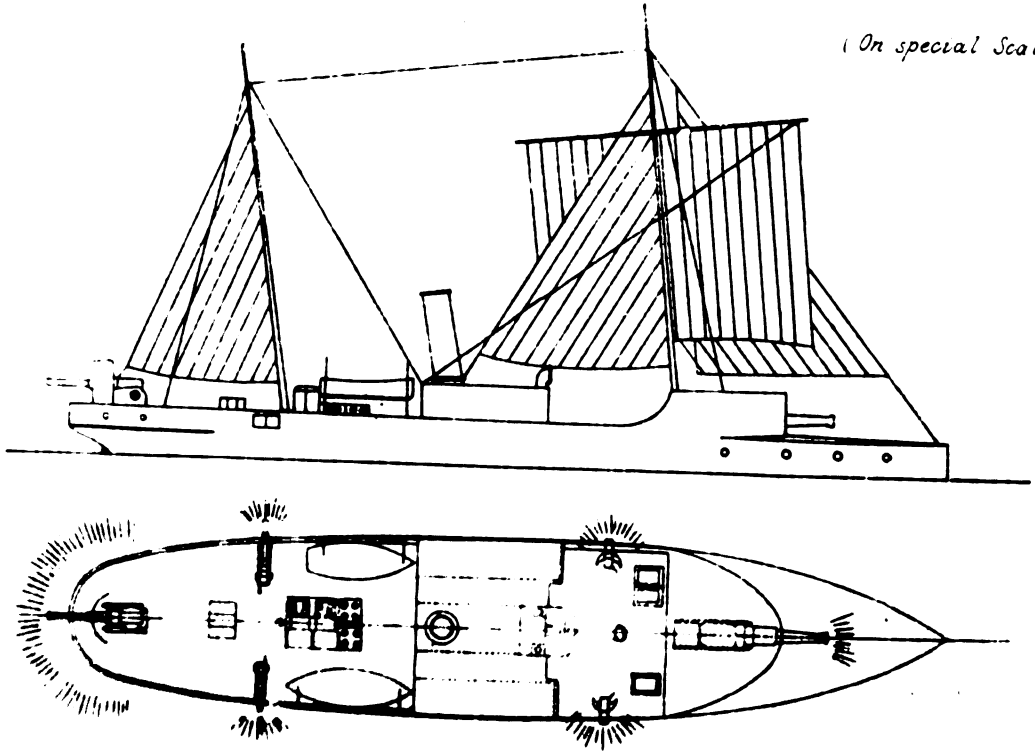
HANHART, LITH

BRITISH COLONIAL (VICTORIA) SHIP.

"Albert"



(On special Scale)

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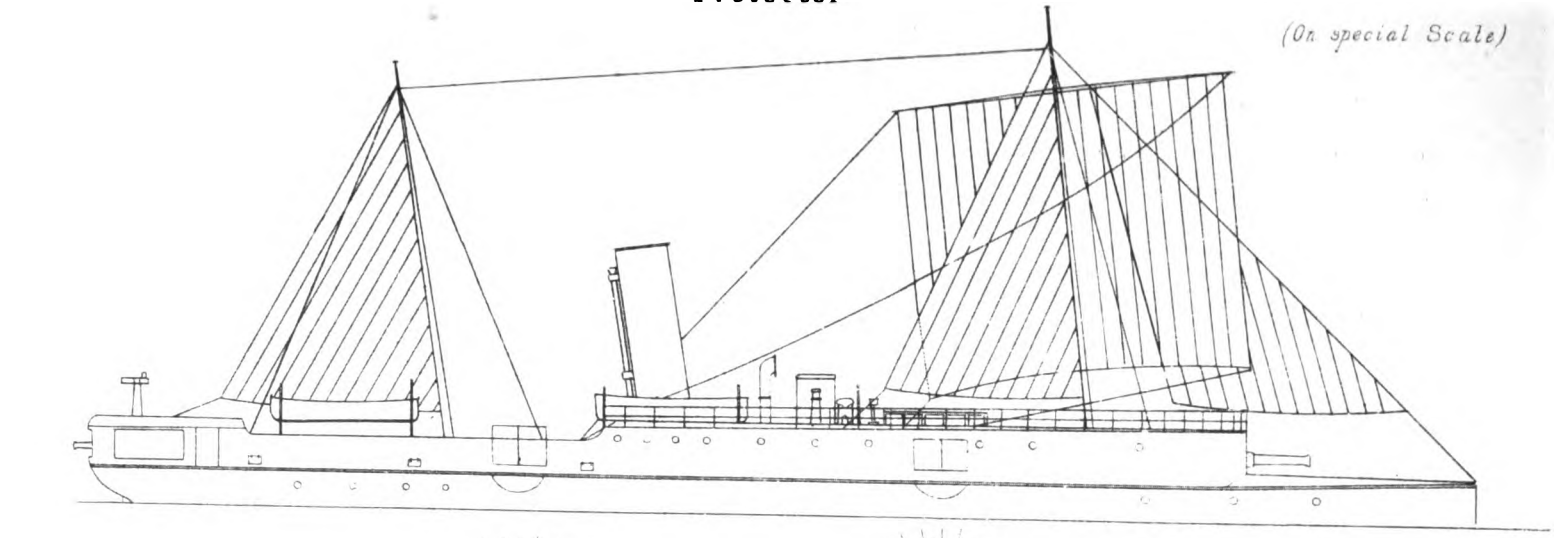
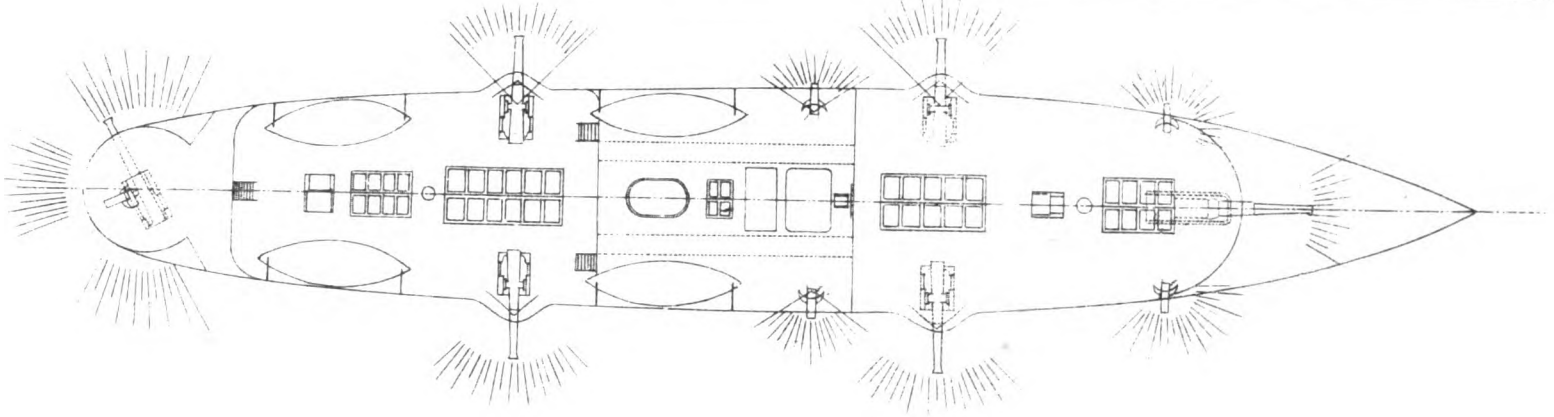
BRITISH COLONIAL (SOUTH AUSTRALIA) SHIP.

"Protector"

Pl. 41

(On special Scale)





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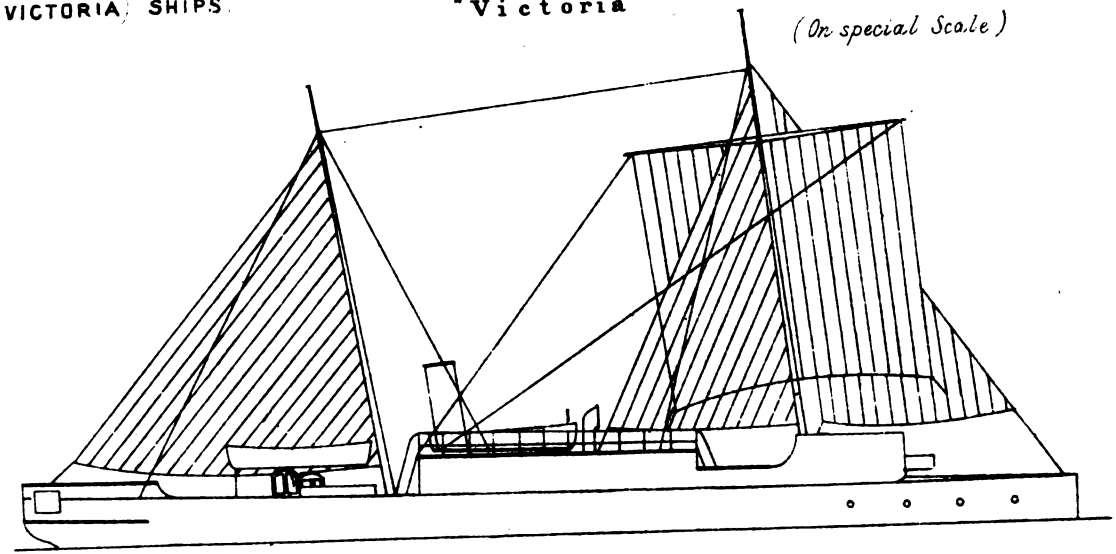
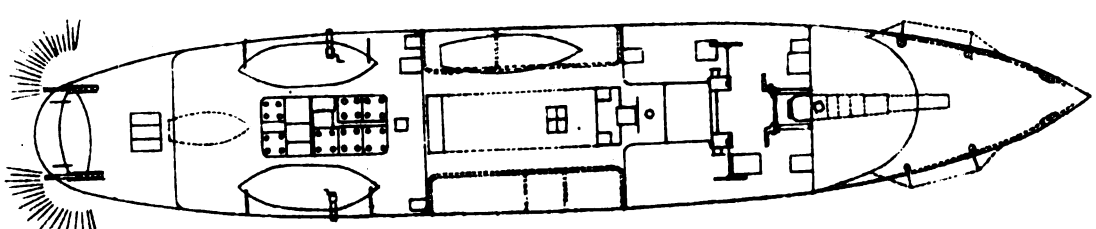
BRITISH COLONIAL (VICTORIA) SHIPS.

"Victoria"

(On special Scale)





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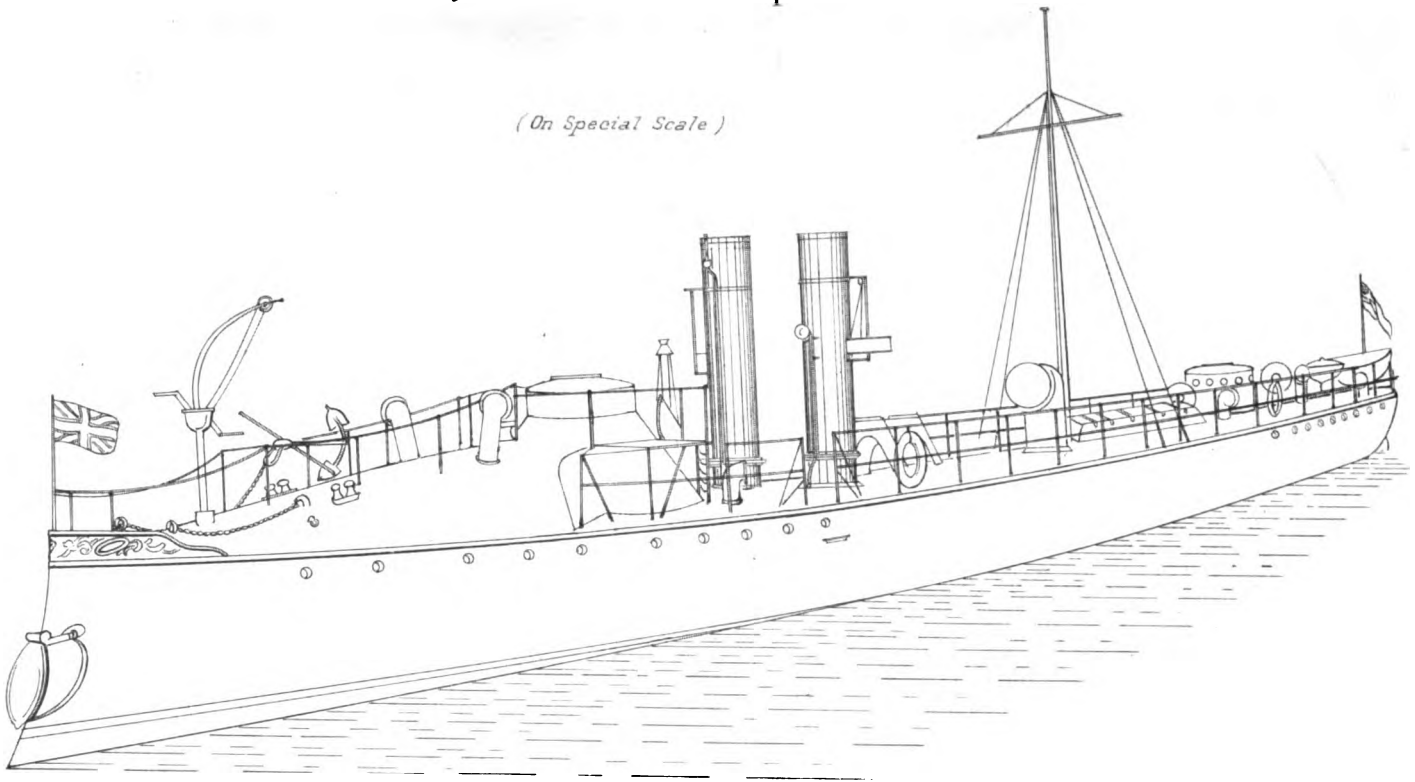
H.M First Class Torpedo Boat N° 80.
Built by Messrs Yarrow at Poplar.

(On Special Scale)



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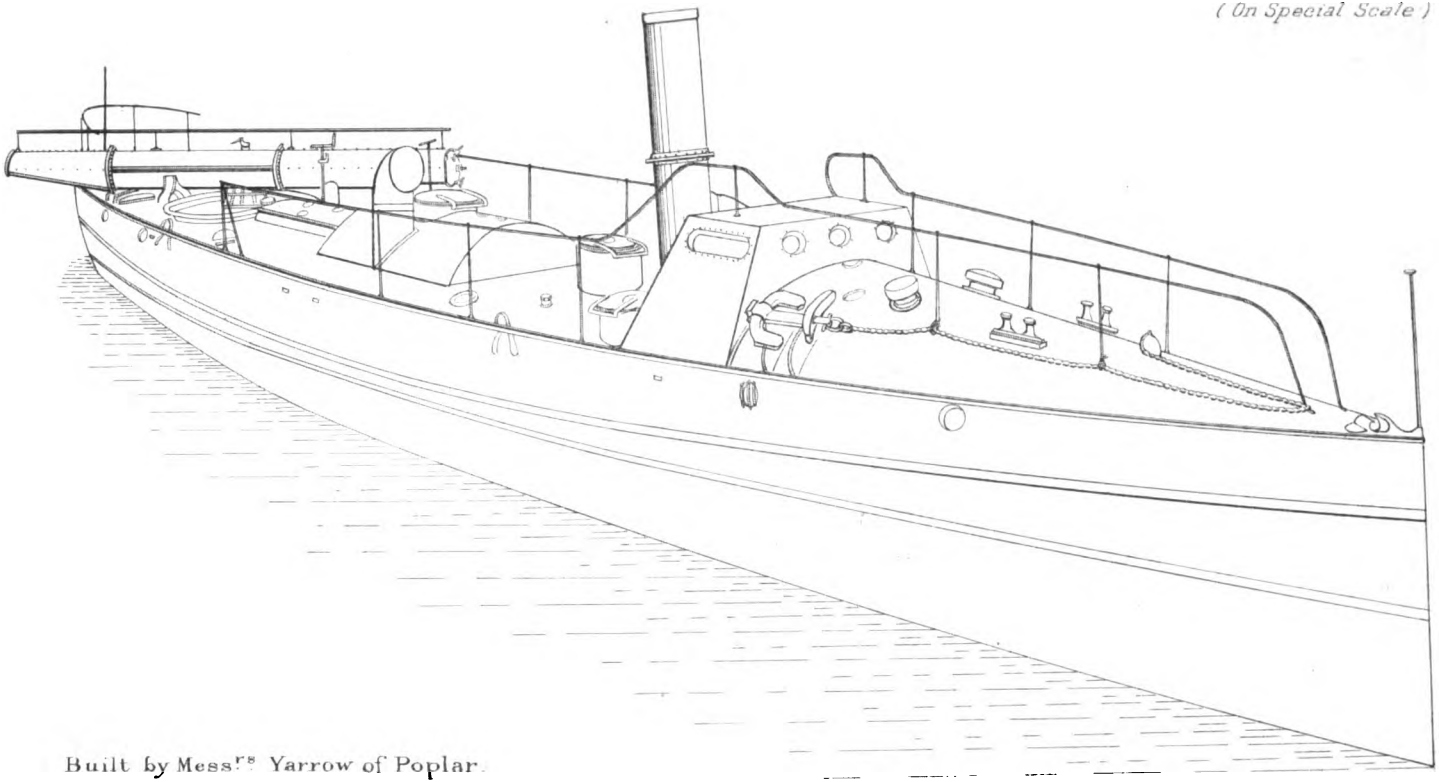
H.M. Second Class Torpedo Boat No 50.
(COMBINED VEDETTE GUN AND TORPEDO BOAT).

(On Special Scale)



Built by Messrs Yarrow of Poplar.

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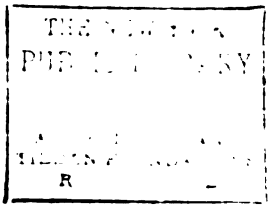
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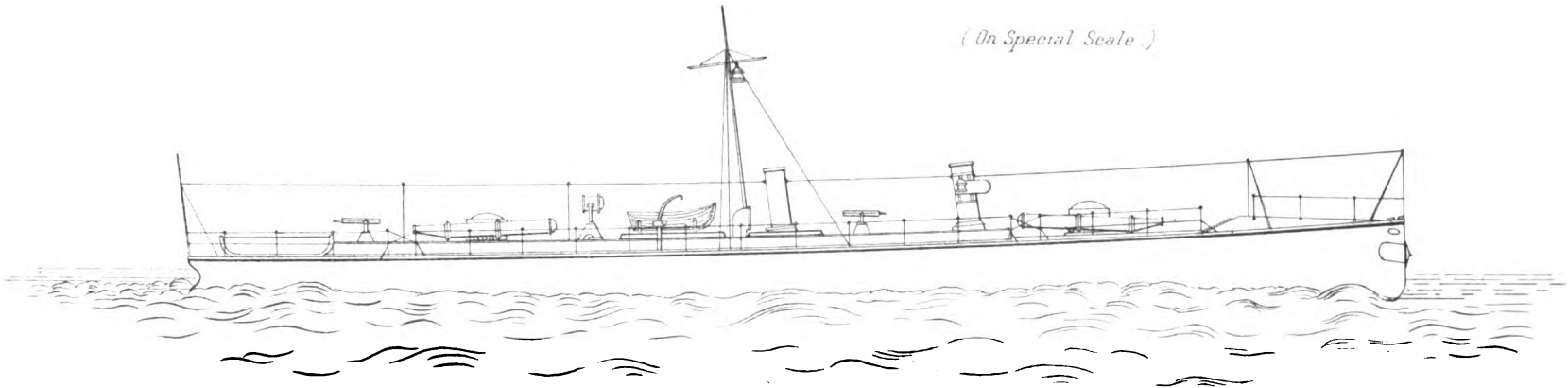
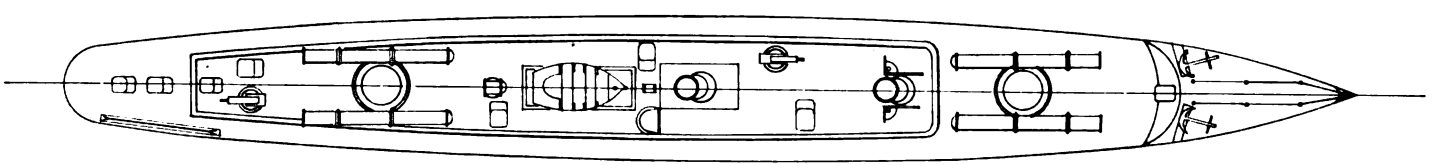
Indian Government Torpedo Boat (First Class)
Built by Messrs Thornycroft & Co of Chiswick.

(On Special Scale.)





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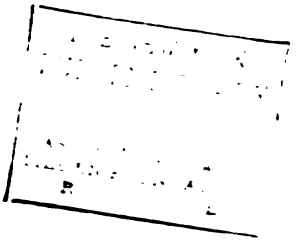

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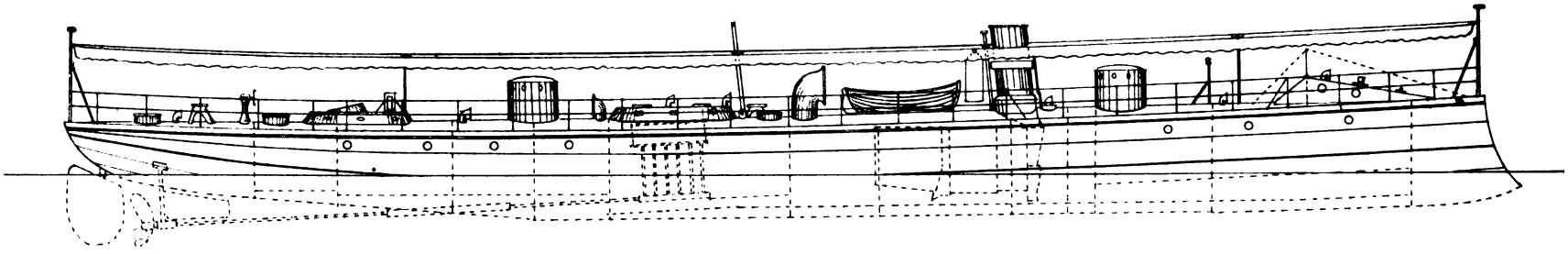
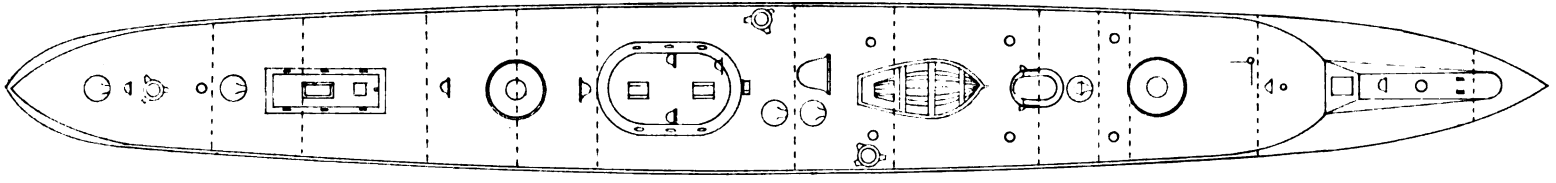
1st CLASS TORPEDO BOAT (TURNABOUT)

Built for the Indian Government by J. Samuel White of Cowes.

(On Special Scale)



Above Deck



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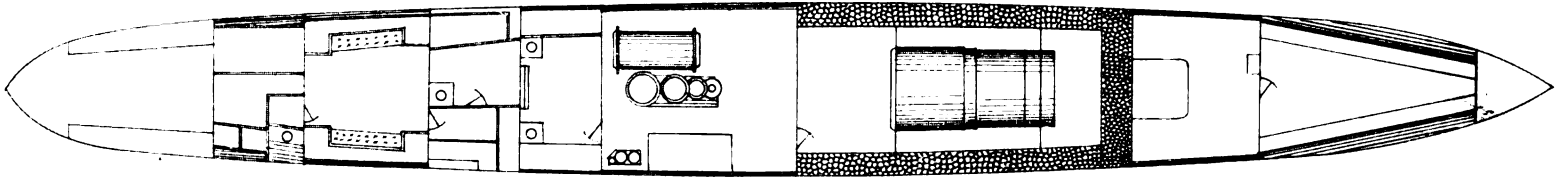

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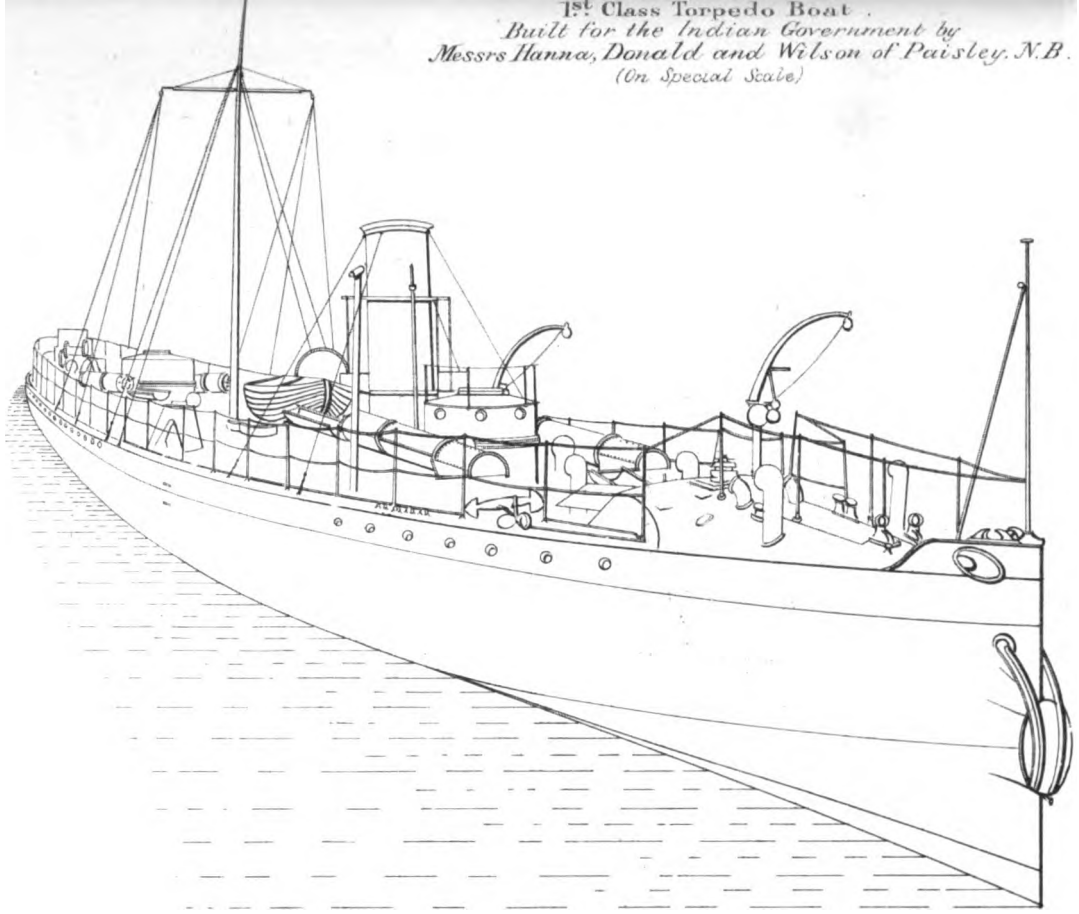
1st Class Torpedo Boat.
Built for the Indian Government by
Messrs Hanna, Donald and Wilson of Paisley. N.B.
(On Special Scale)



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THE NORDENFELT SUBMARINE TORPEDO BOAT

(In Special Scale)

Fig. 1.

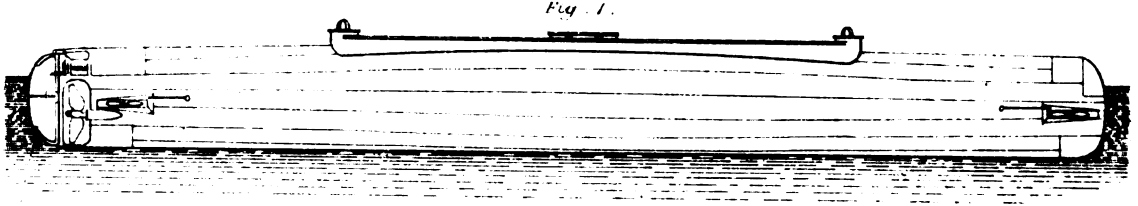


Fig. 2.

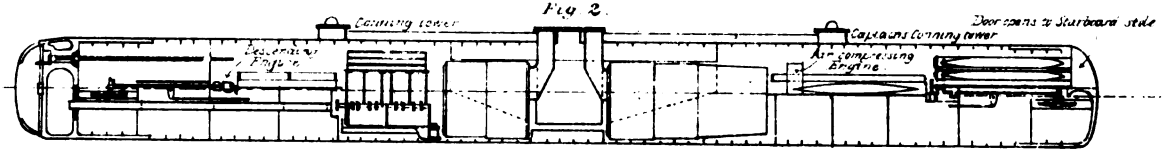
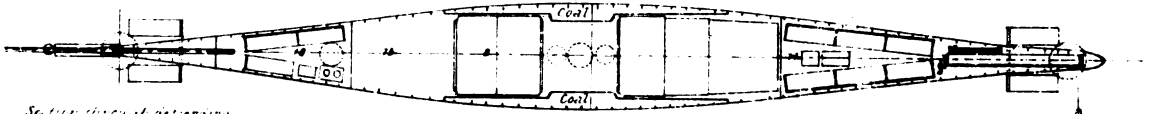
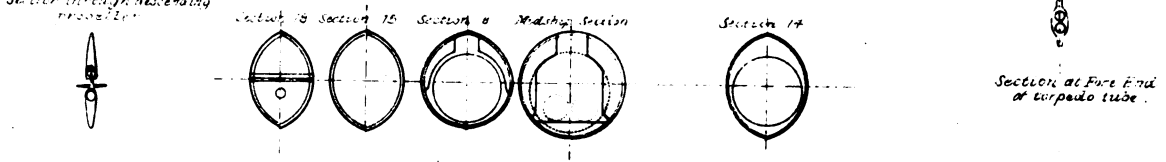


Fig. 3





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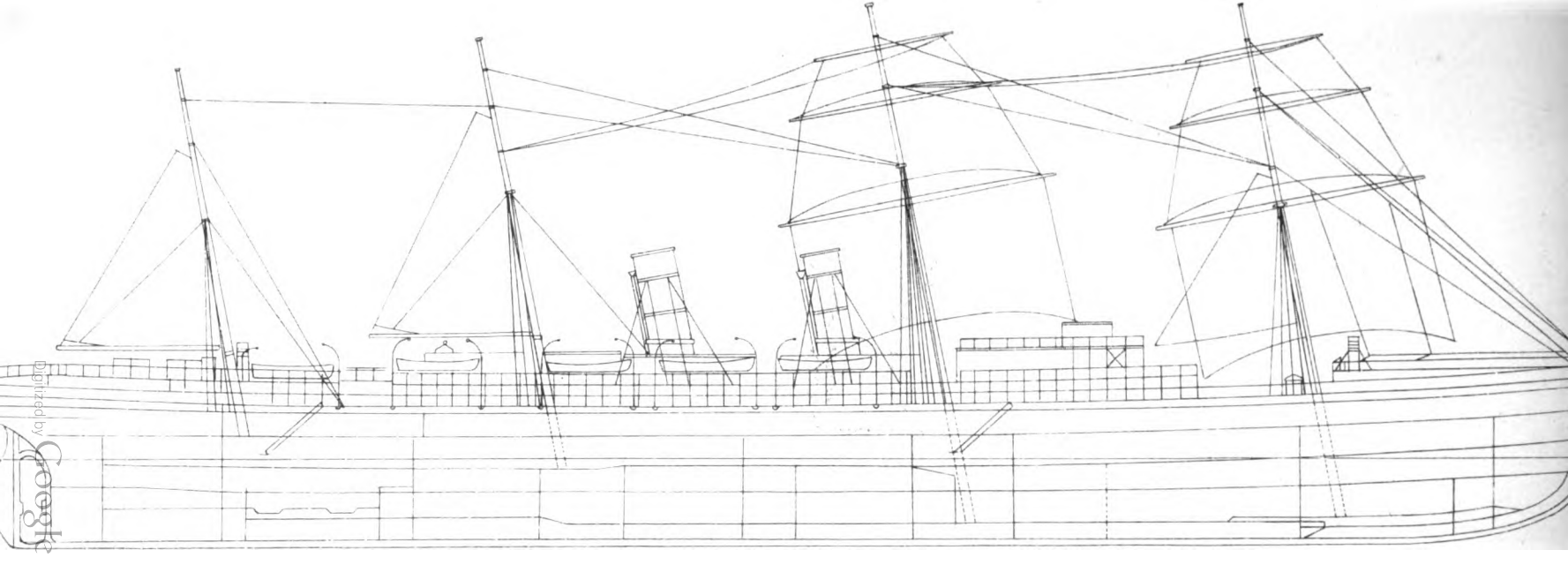
BRITISH MERCHANT SHIPS

"Ormuz".

(Orient Steam Navigation Co.)



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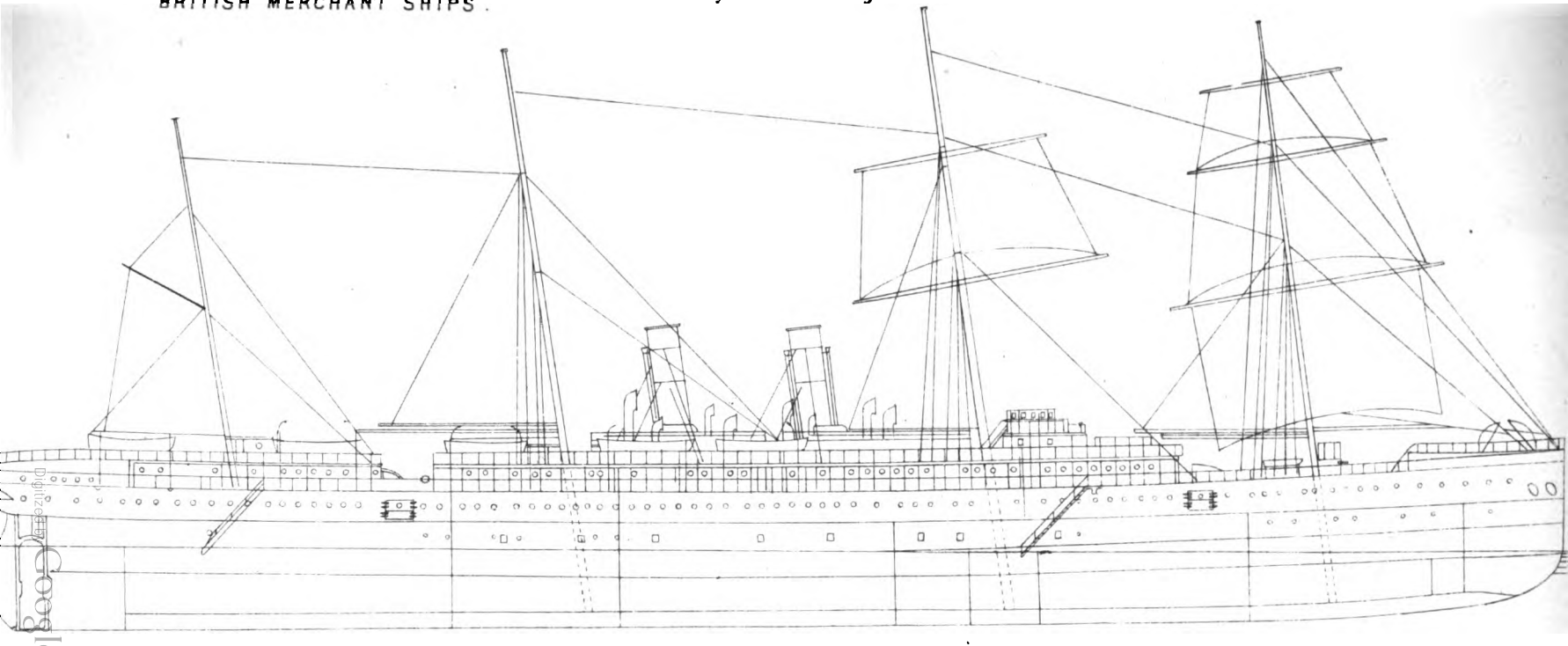
BRITISH MERCHANT SHIPS.

"Oroya" & "Orizaba."



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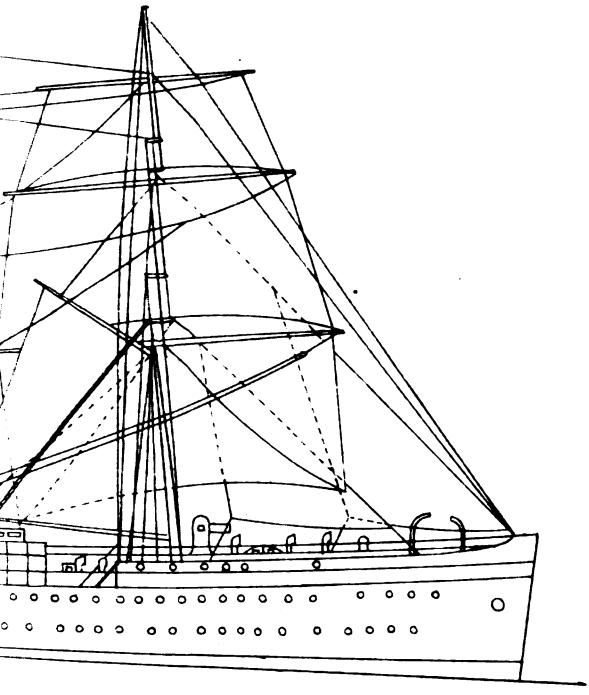
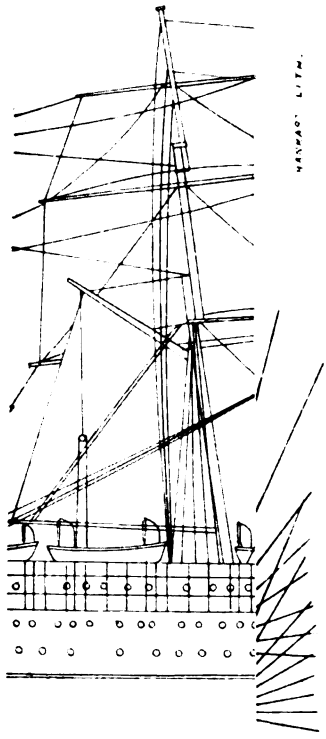
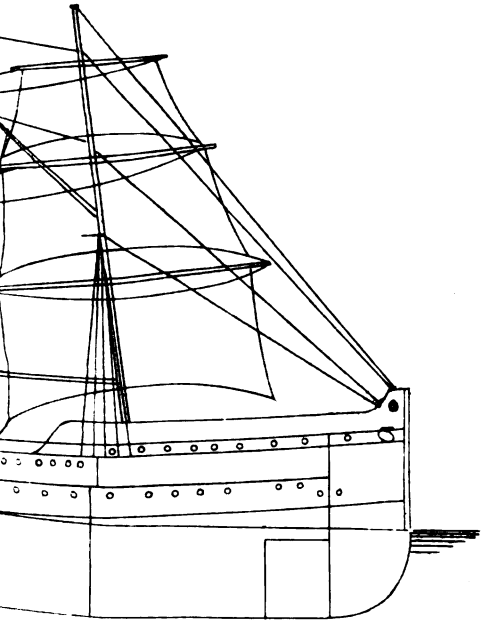
Pl. 46.

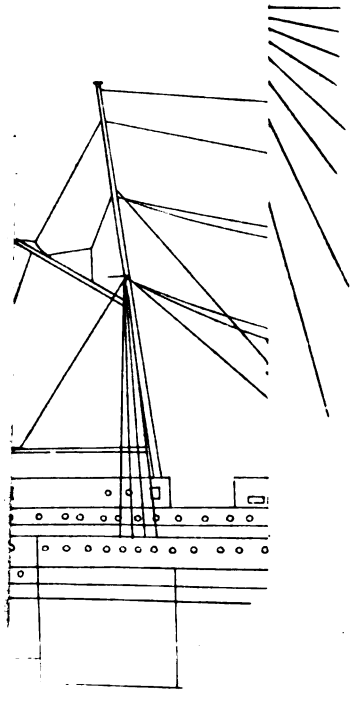
T SHIPS.





& "Arcadia".





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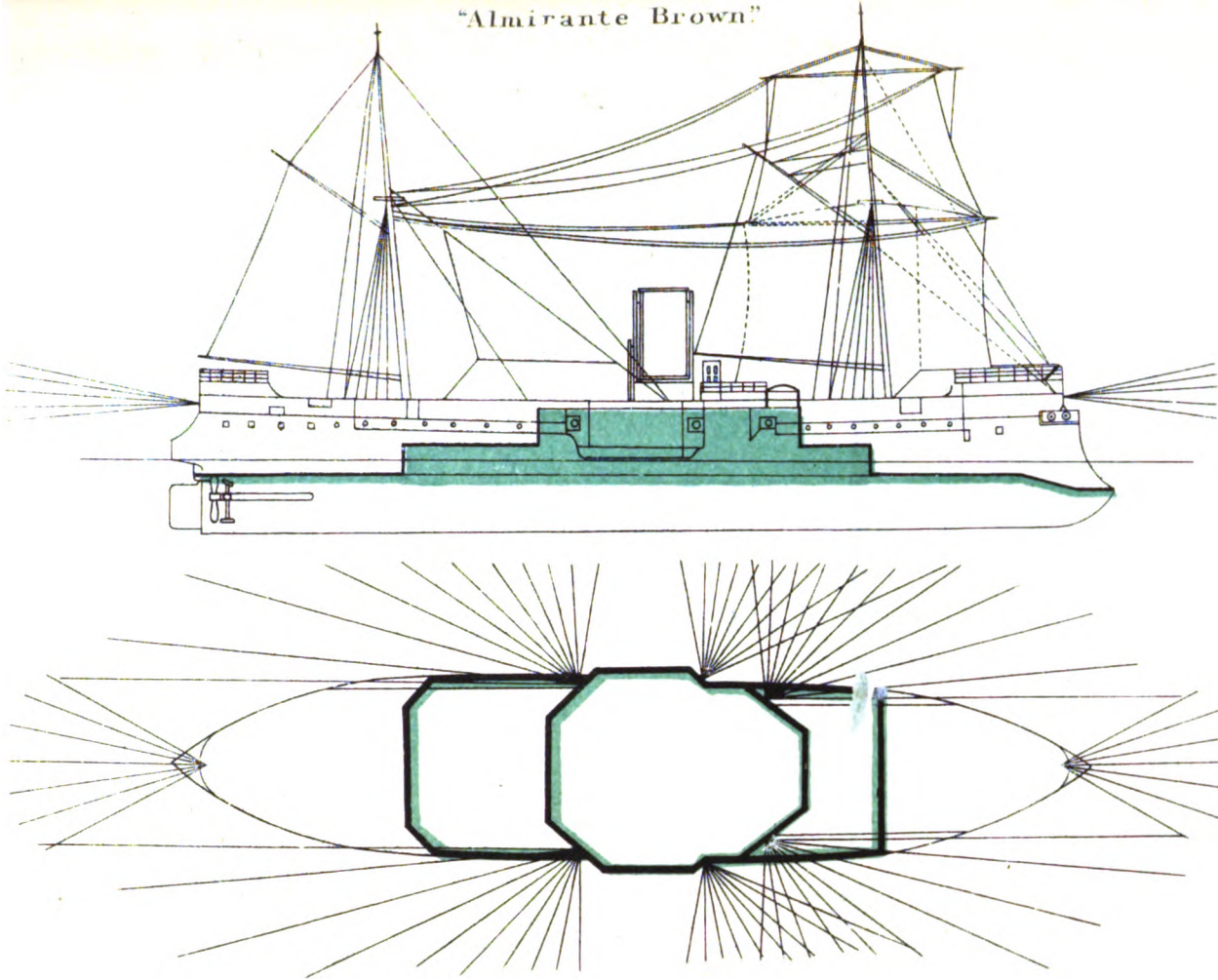
"Almirante Brown"



HANHART LITH.

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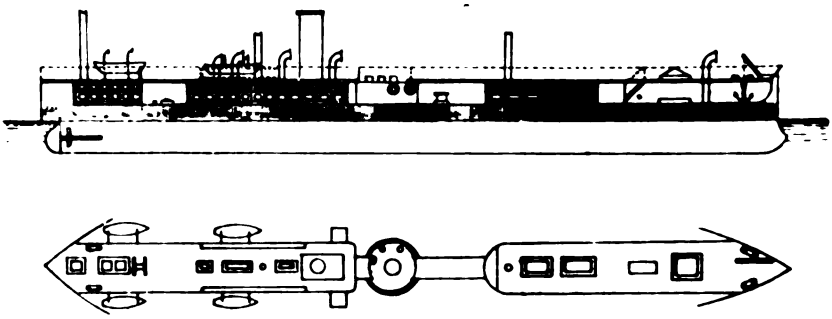
ARGENTINE REPUBLIC SHIPS.

"El Plata" & "Los Andes".



"Patagonia".

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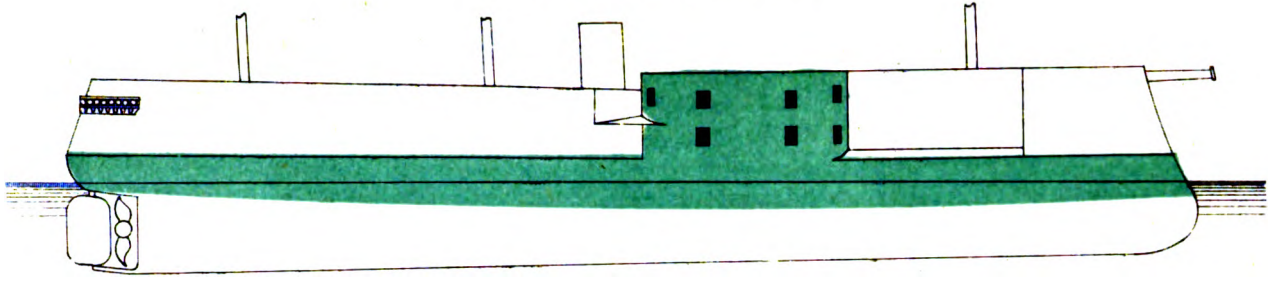
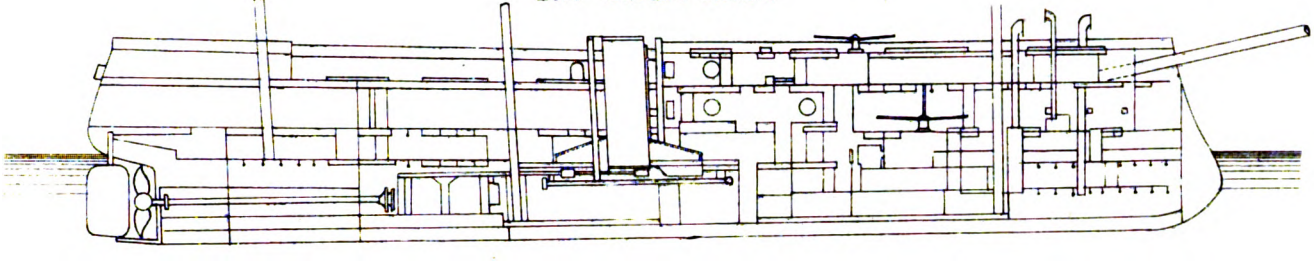
"Archduke Albert."



"Archduke Albert"

Fore and Aft Section.



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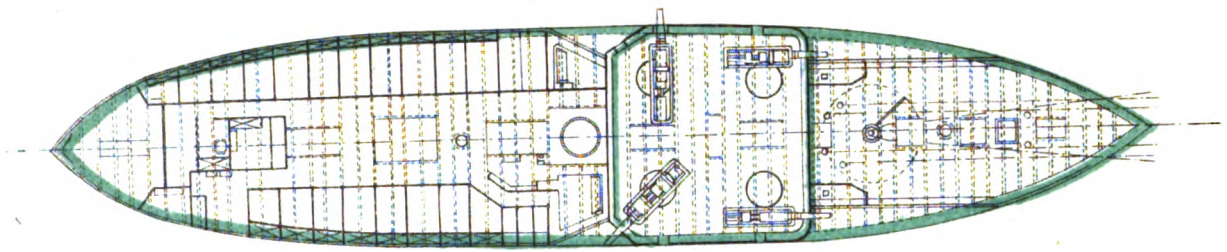
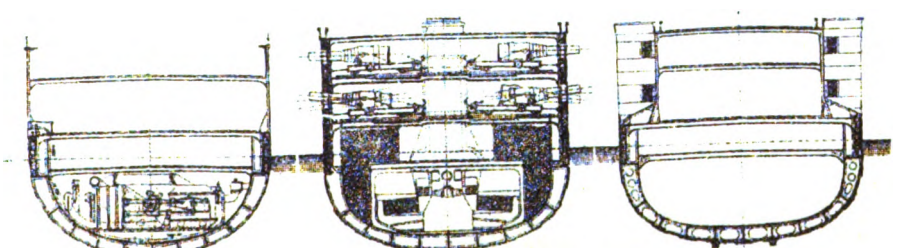
AUSTRIAN SHIPS.

"Archduke Albert."

Main Deck.





'ARCHDUKE ALBERT' (SECTION).

HANHART LITH

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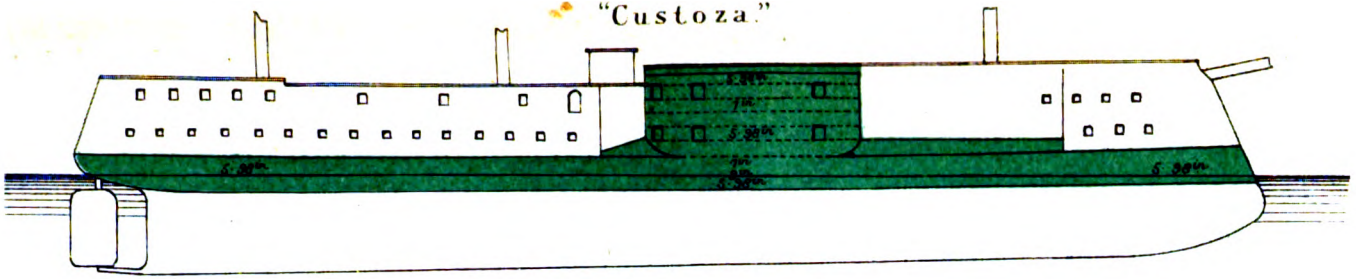
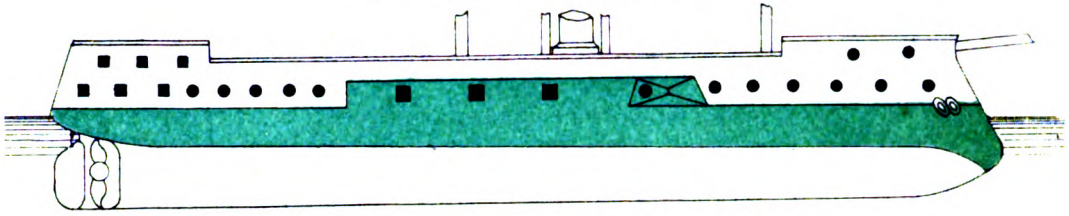
"Custoza."

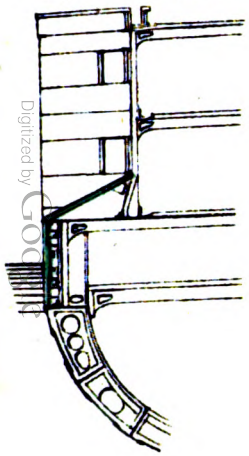


"Don Juan" de Austria.

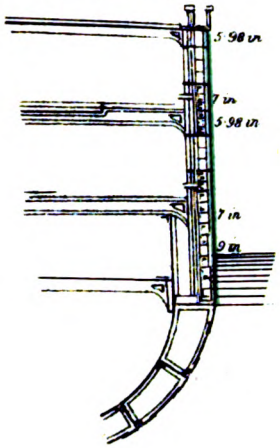


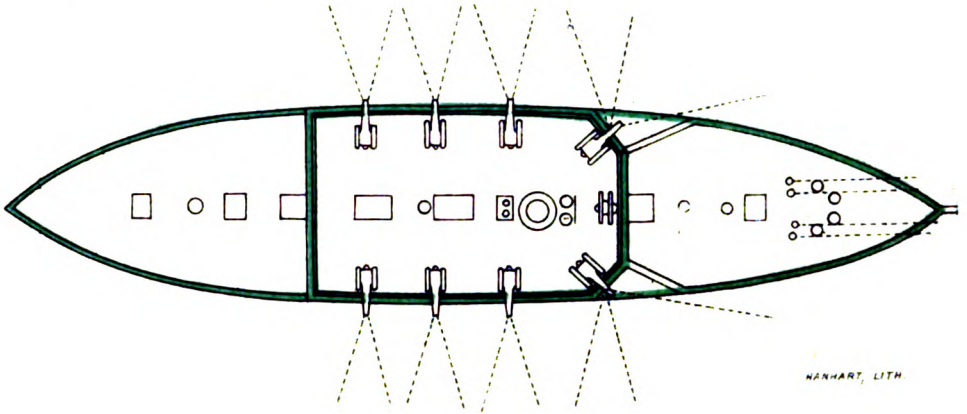
"Custoza."

before the Battery



in the Battery





HANHART, LITH.

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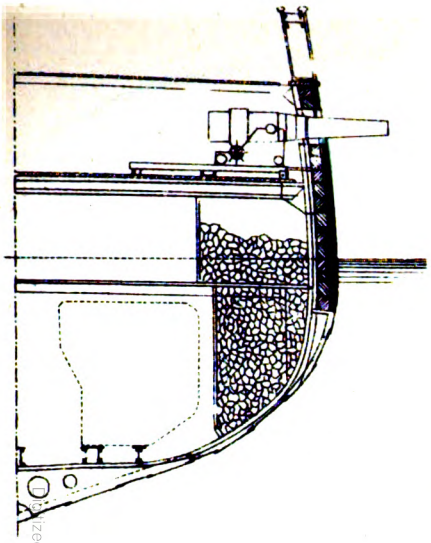
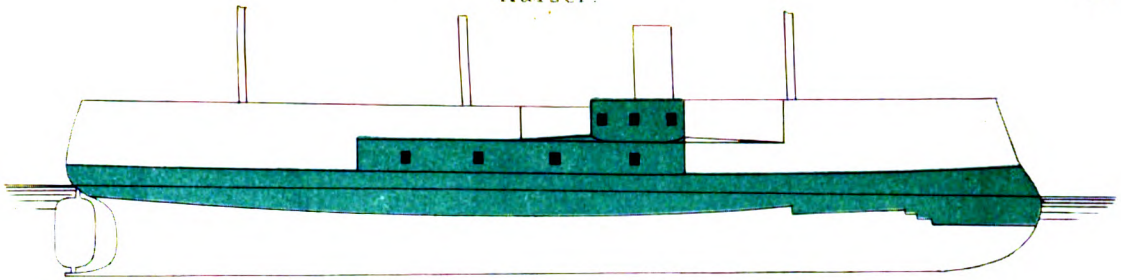
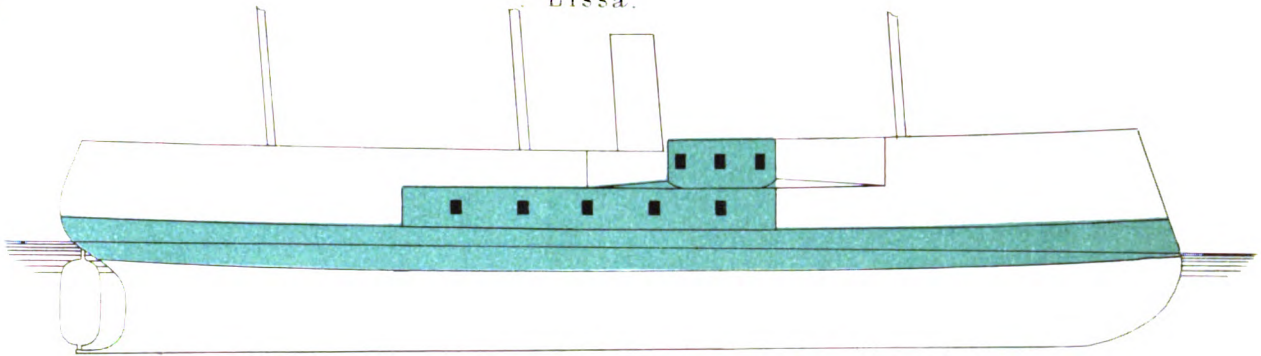
"Don Juan"
Section (as Rebuilt)



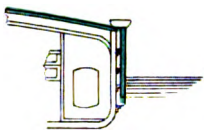
"Kaiser."

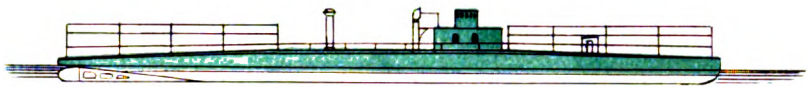


"Lissa."



"Leitha" & "Maros" *(River Monitors*





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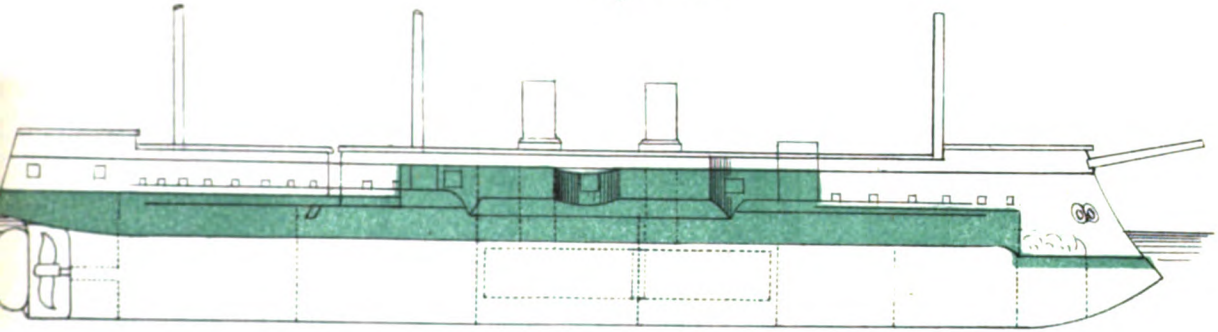
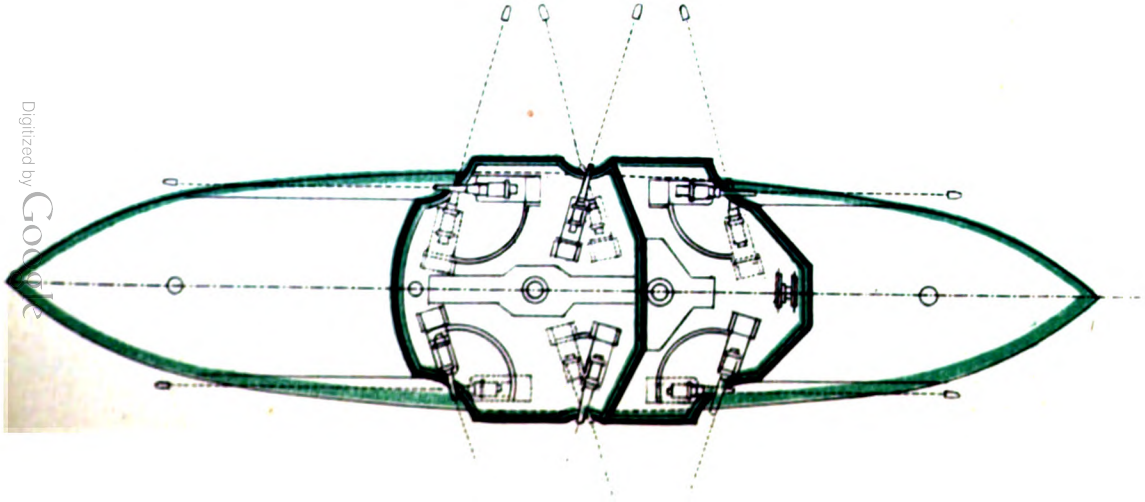
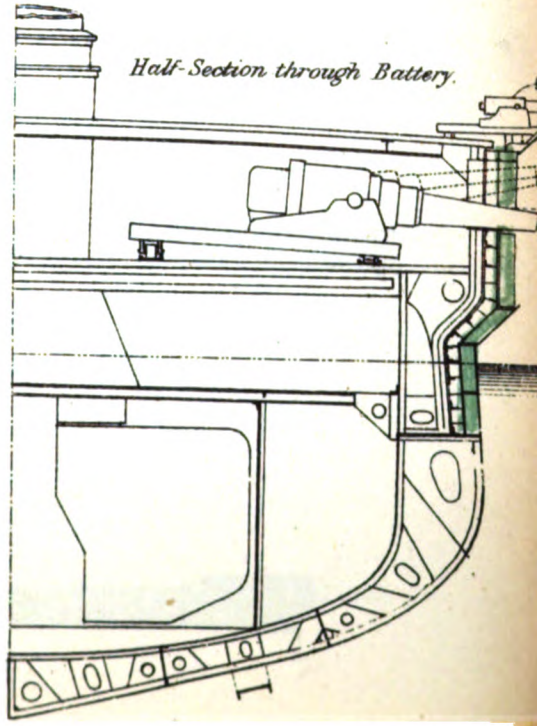
"Tegetthoff"





Half-Section through Battery.



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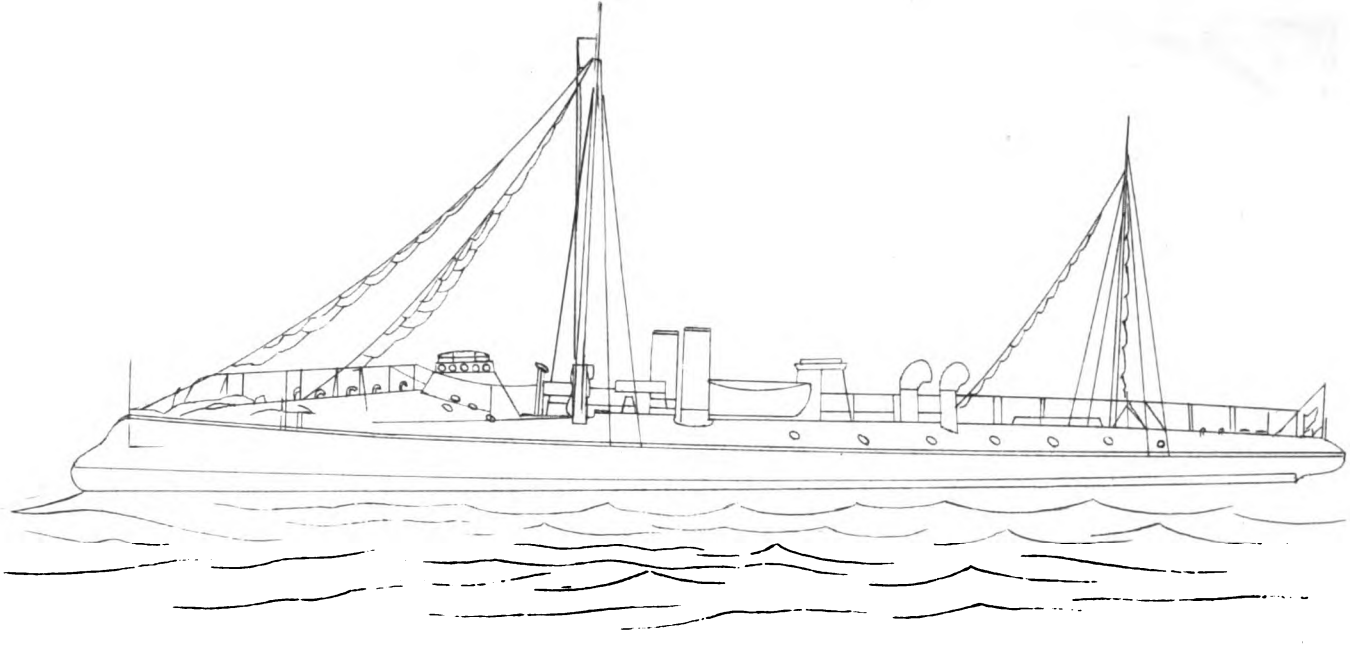
AUSTRIAN SHIP.

"Falke" (Torpedo Boat.)



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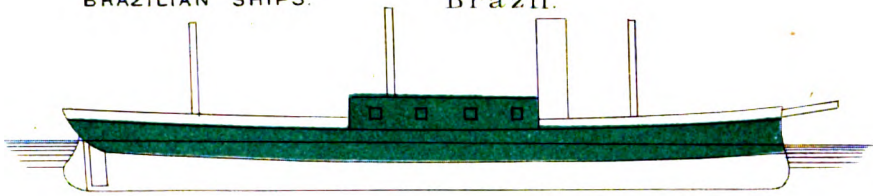
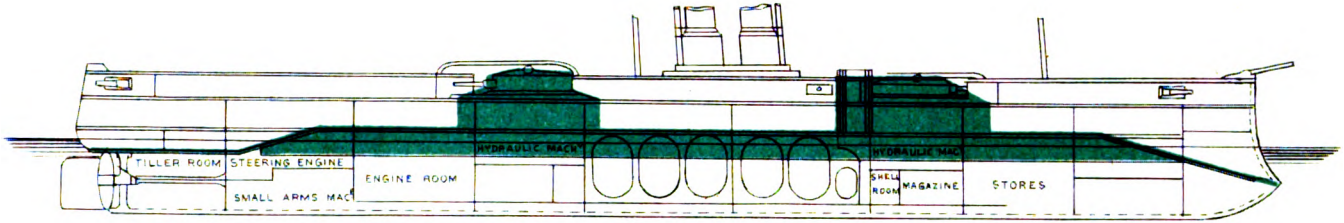
BRAZILIAN SHIPS.

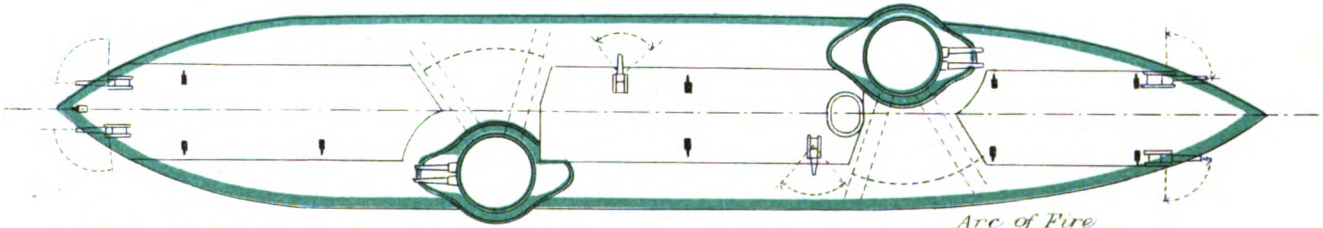
"Brazil."



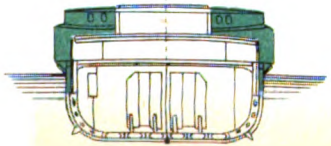
"Riachuelo."



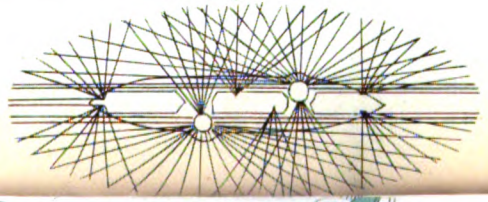
Plan of Upper Deck.



Midship Section



Arc of Fire



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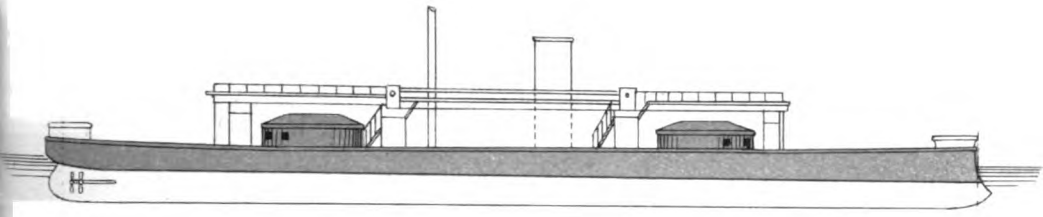
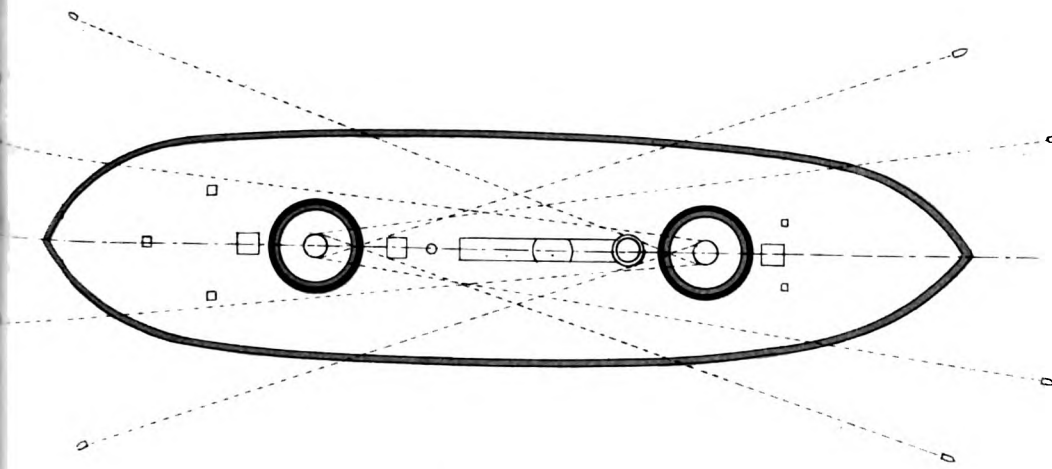
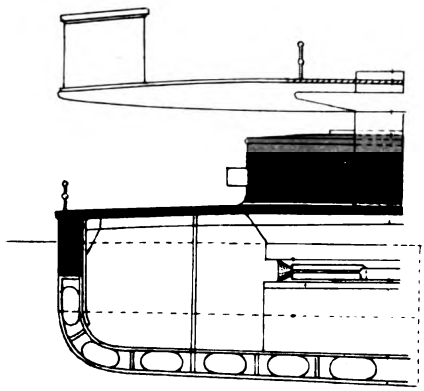
BRAZILIAN SHIPS.

"Solimoes" & "Javary."





Section.



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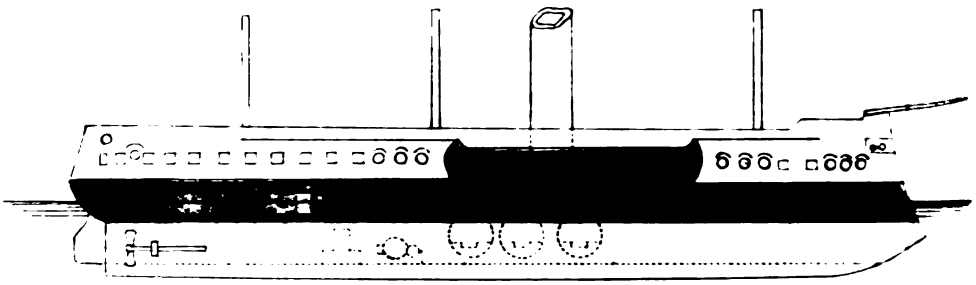
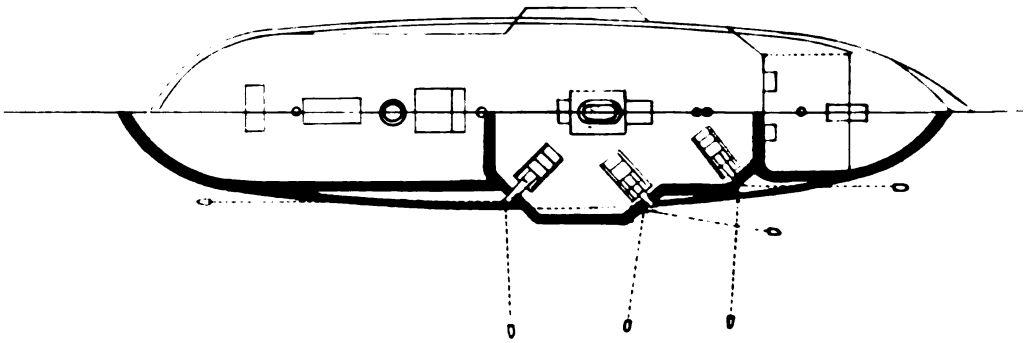
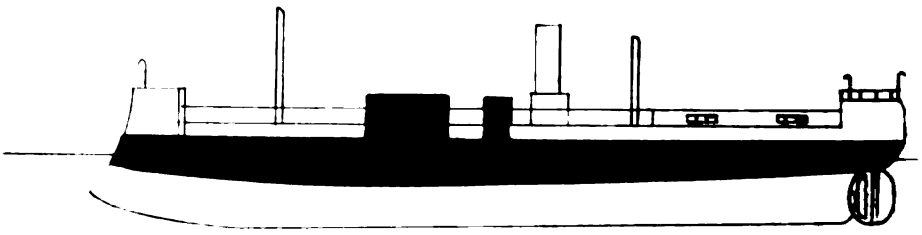
CHILEAN SHIPS

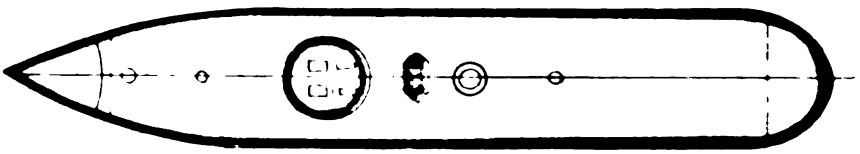
"Almirante Cochrane"
"Blanco Encalada"





"Huascar"





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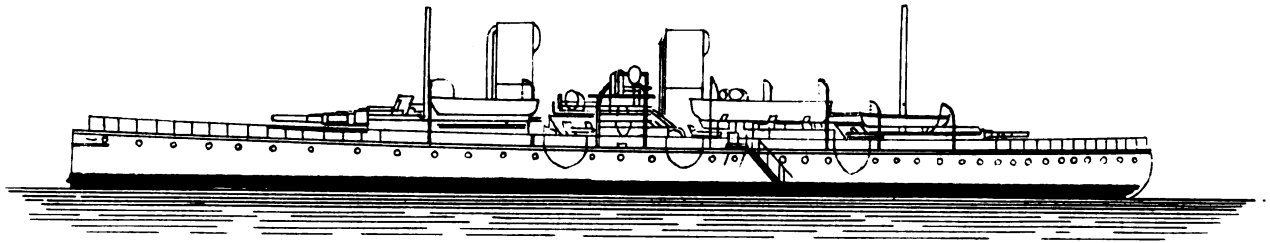
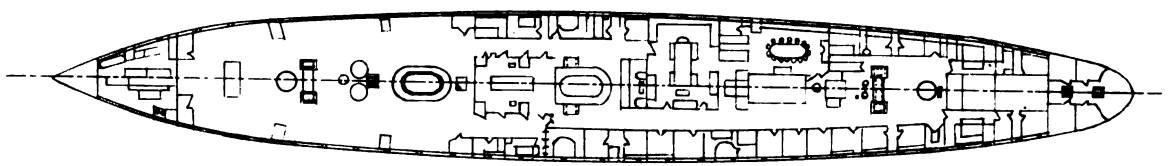
CHILIAN SHIPS

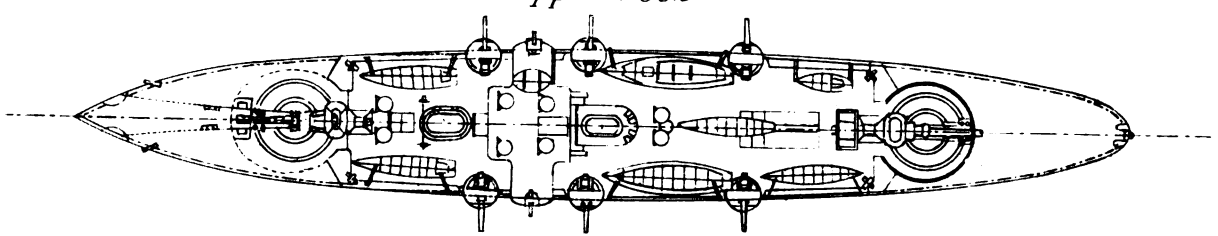
"Esmeralda"



Main Deck



Upper Deck



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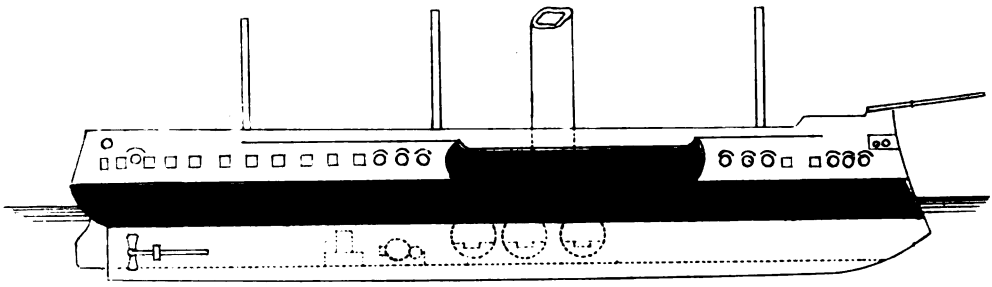
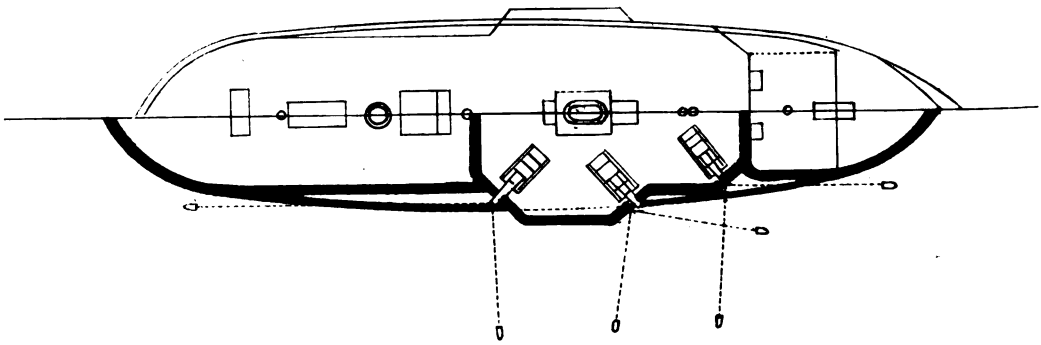
HANHART LITH

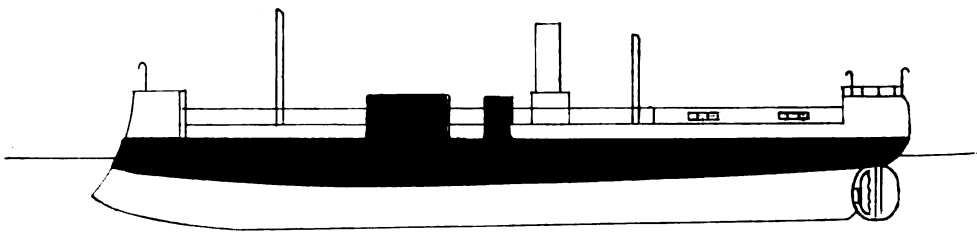
CHILIAN SHIPS.

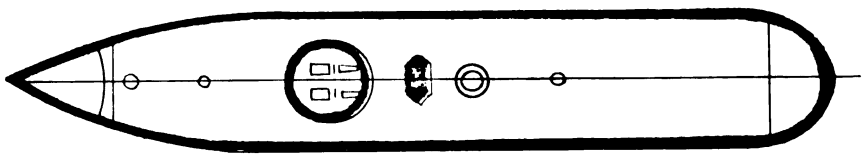
"Almirante Cochrane"
"Blanco Encalada"





"Huascar"





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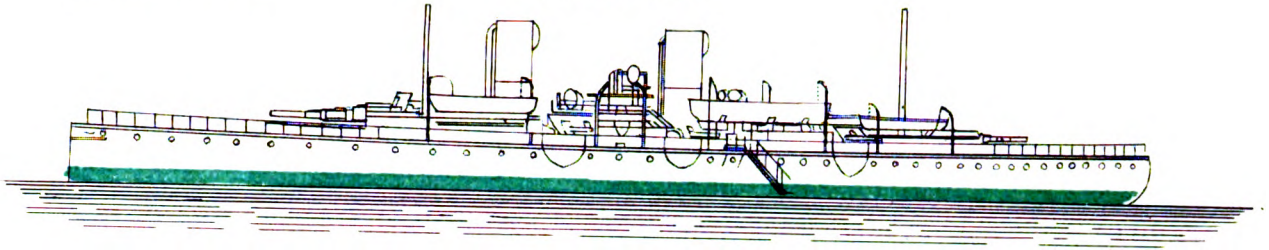
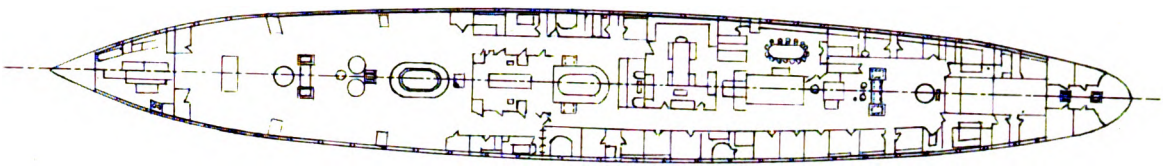
CHILIAN SHIPS

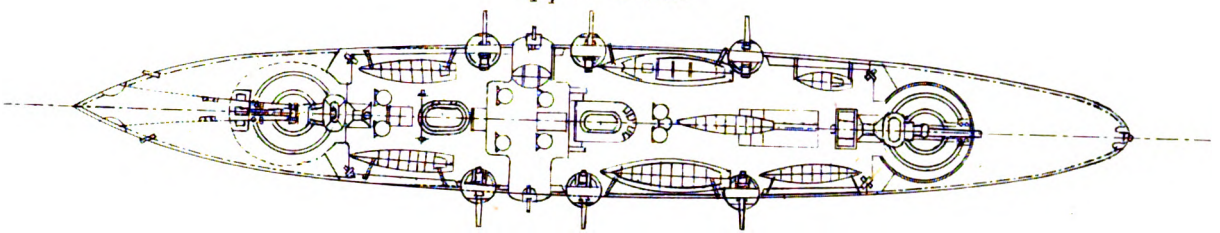
"Esmeralda"



Main Deck



Upper Deck



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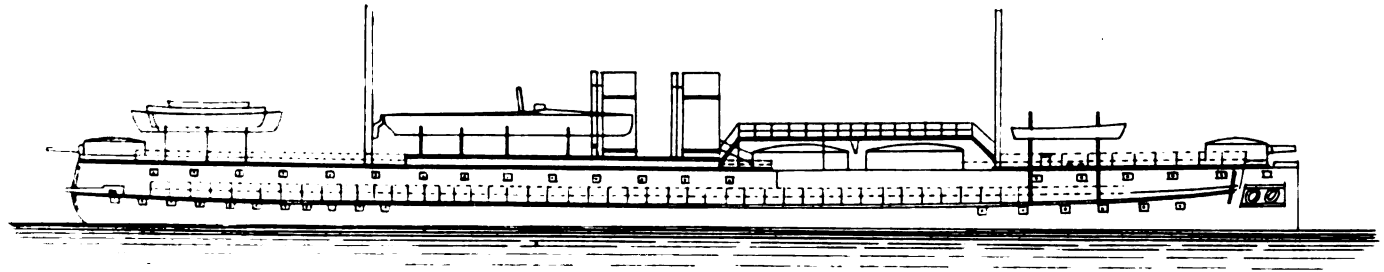
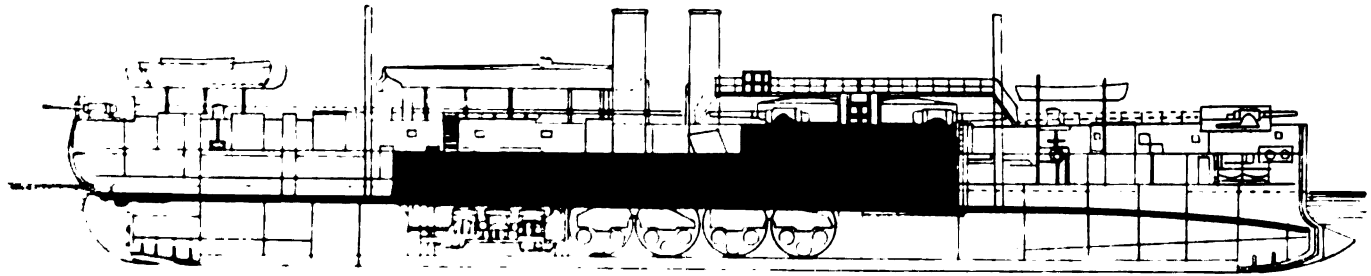
CHINESE SHIPS.

"Ting Yuen" & "Chen Yuen".





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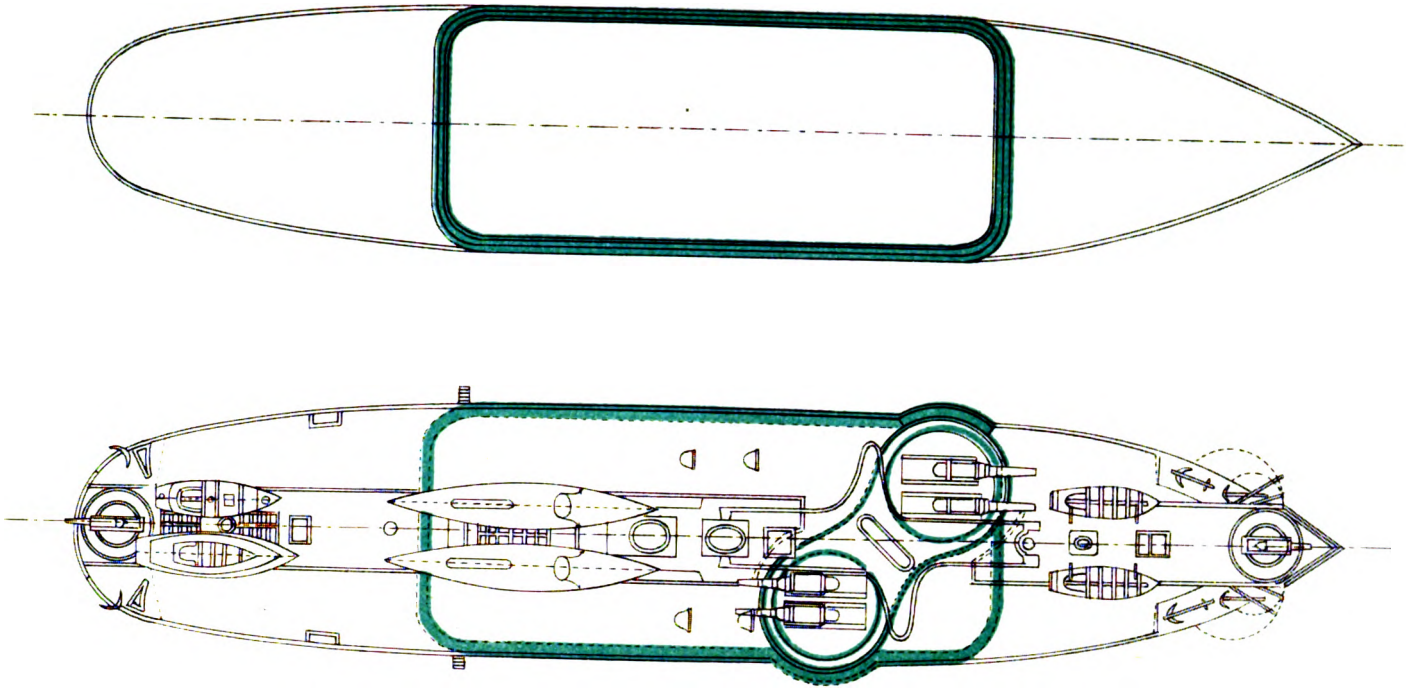
CHINESE SHIPS.

"T'ing Yuen" & "Chen Yuen"



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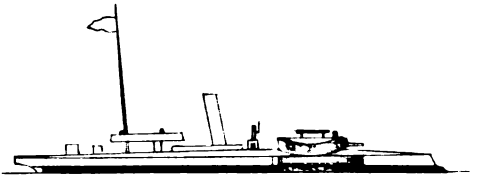
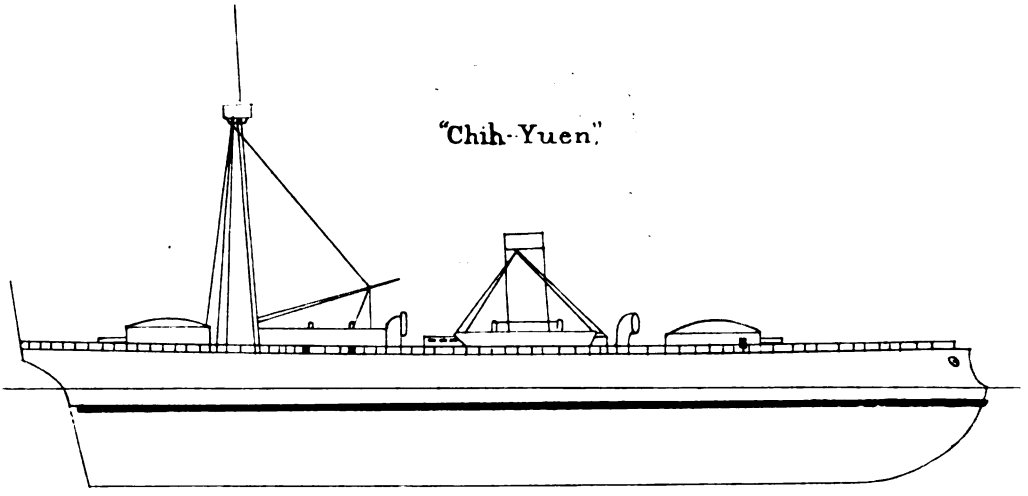
CHINESE SHIPS

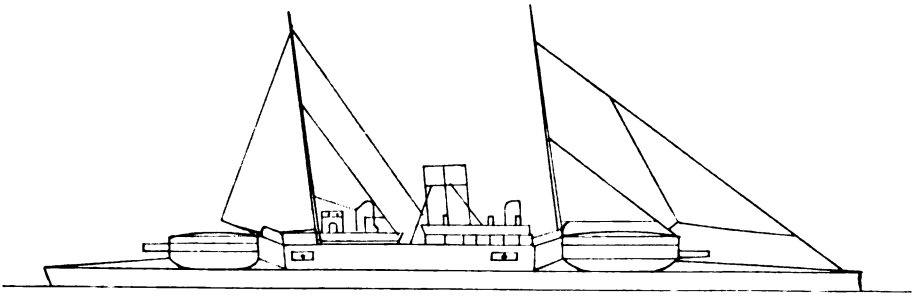
"Tien-Sing."



"Chih-Yuen."



"Tshao-Yong"



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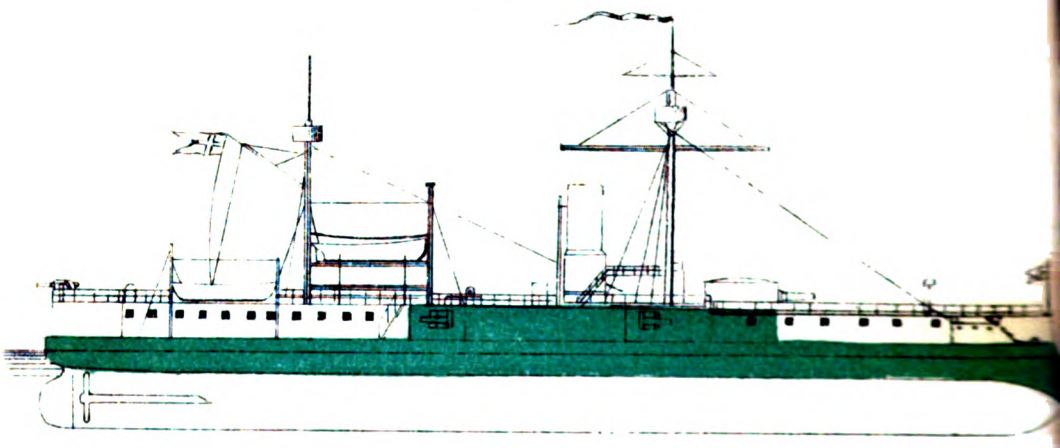
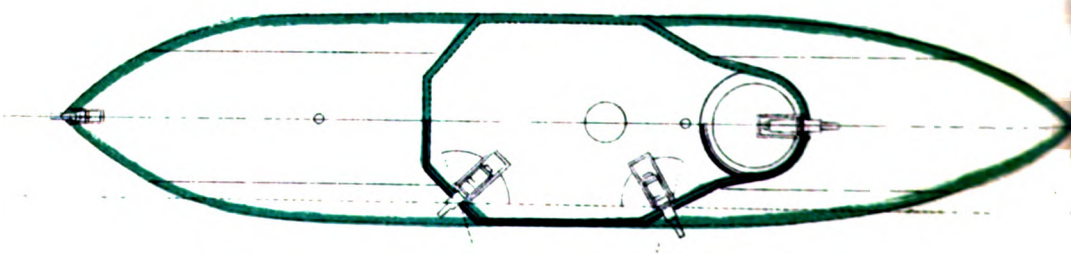
DANISH SHIPS.

"Helgoland"





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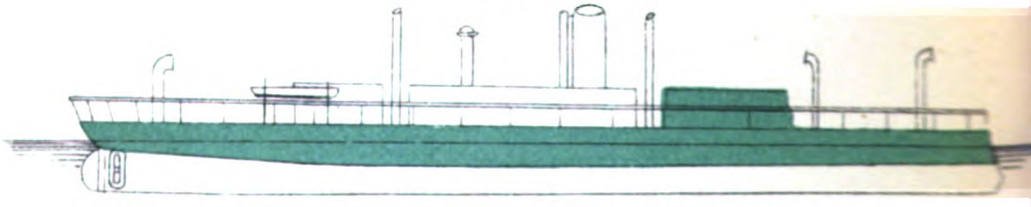

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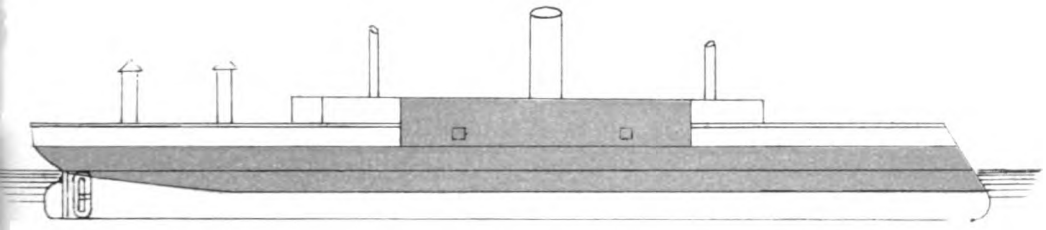
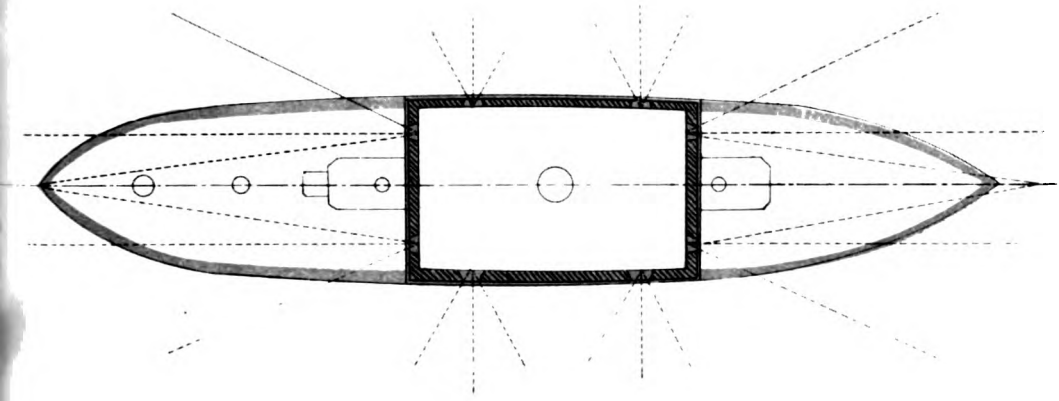
DANISH SHIPS.

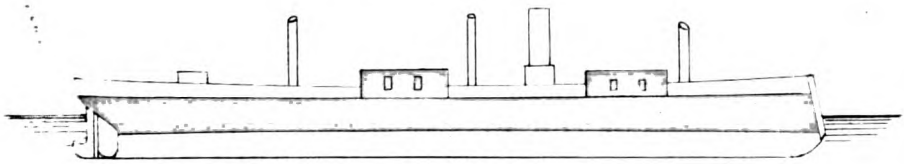
Pl 64

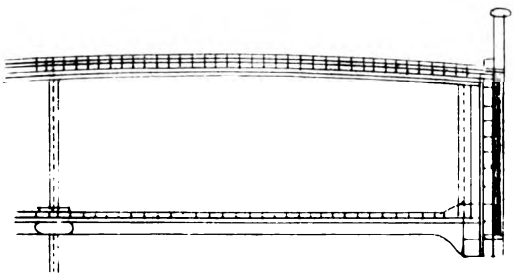
"Odin"





"Rolf Krake"





MAULART LITH

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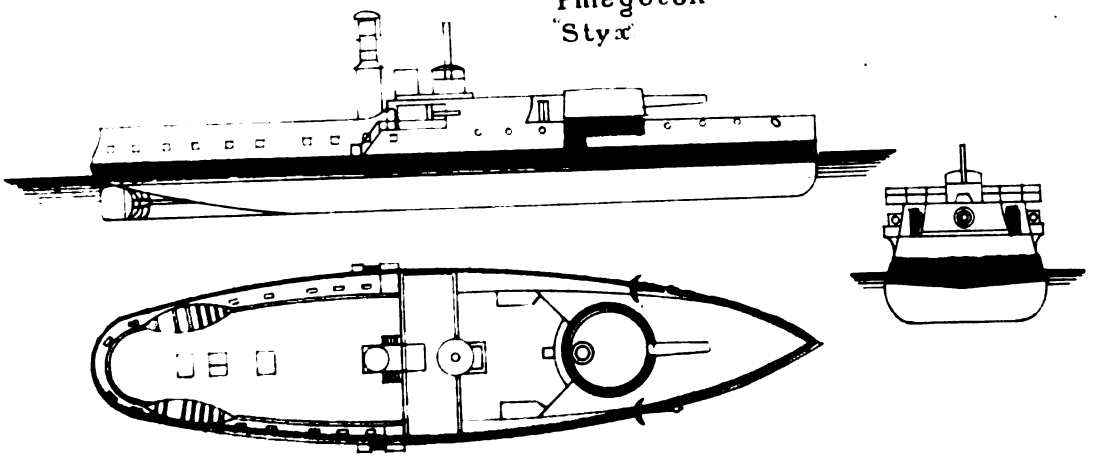
FRENCH SHIPS

"Acheron"
"Cocyte"
"Phlegeton"
"Styx"



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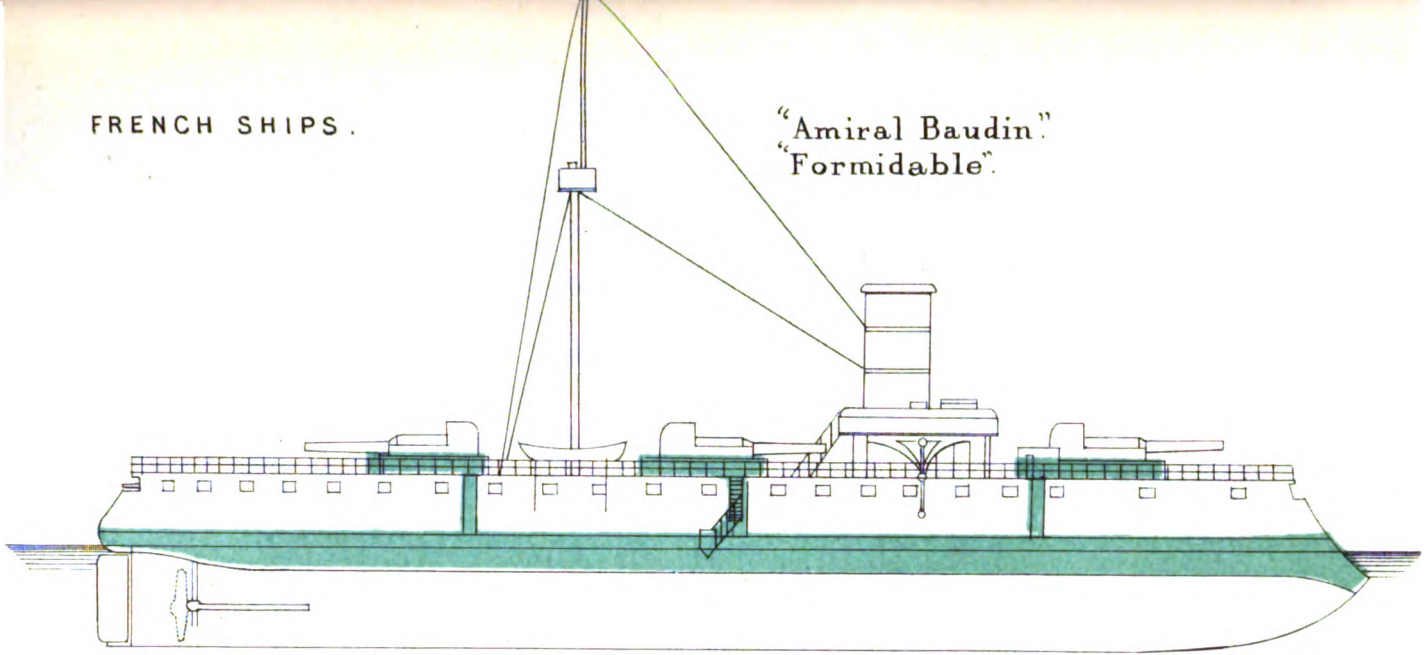
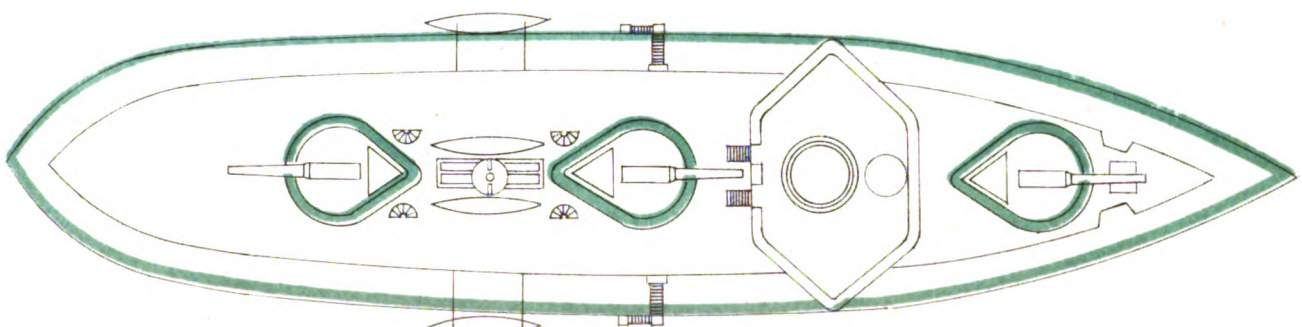
FRENCH SHIPS.

"Amiral Baudin".
"Formidable".





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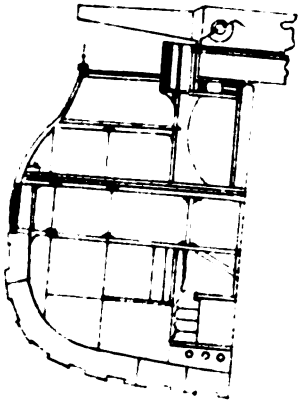
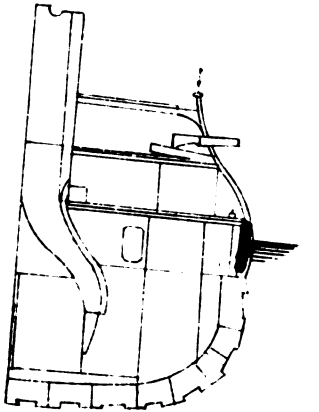
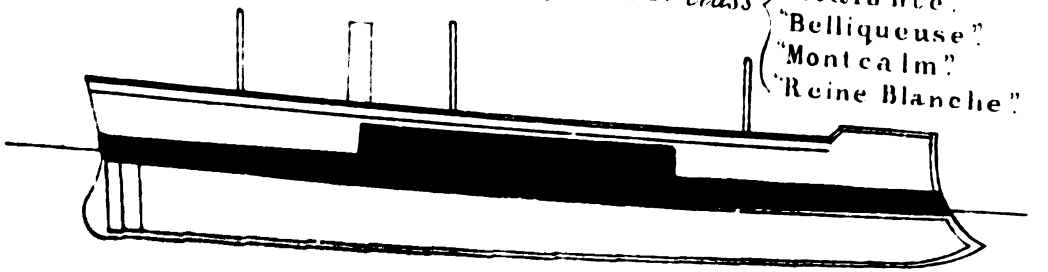


"Amiral Baudin"
Formidable.



"Belliqueuse" class { "Alma" "Atalante" "Belliqueuse" "Montcalm" "Reine Blanche" }



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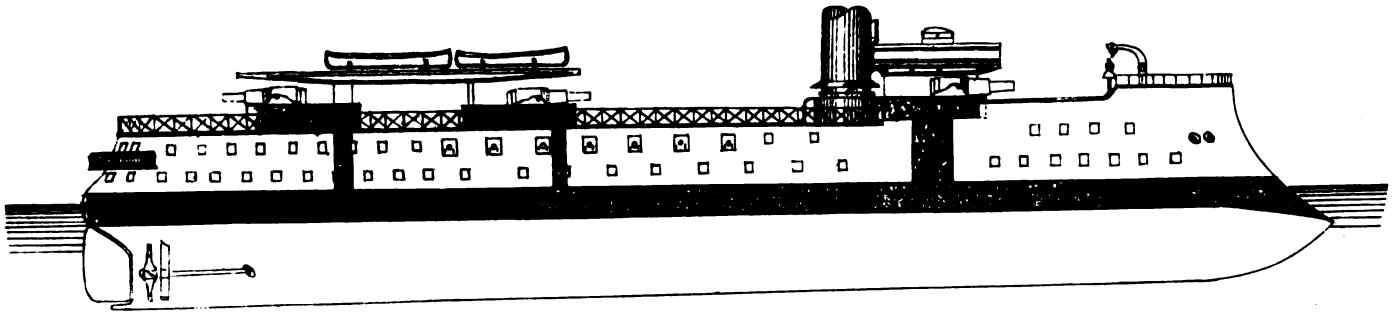

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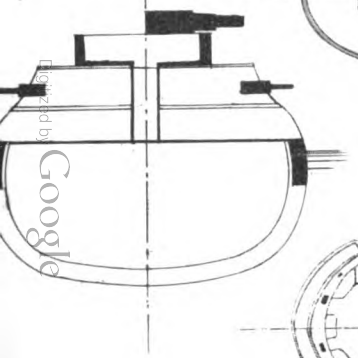
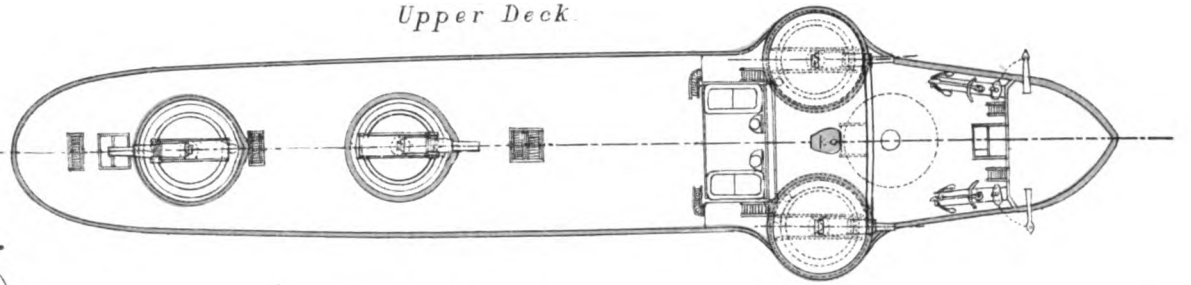
On Special Scale





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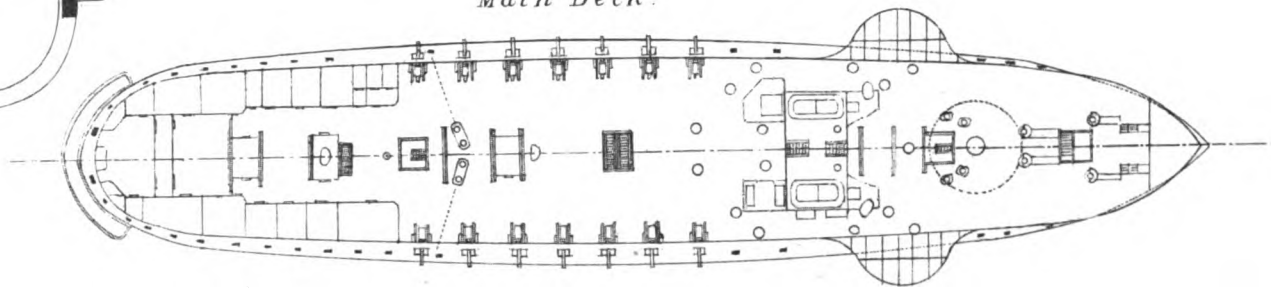

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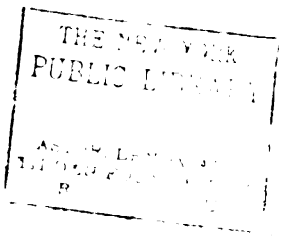
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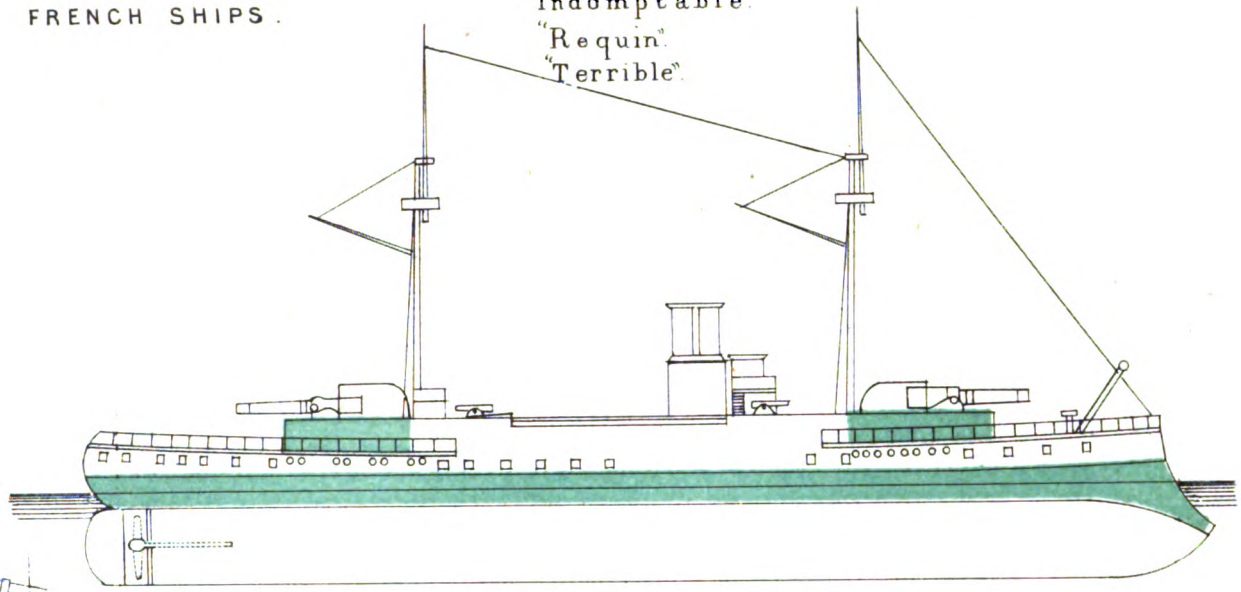
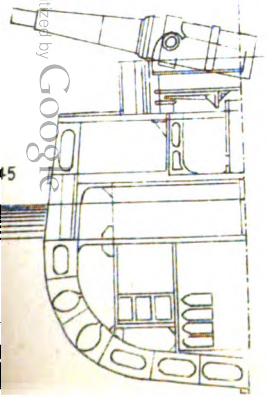
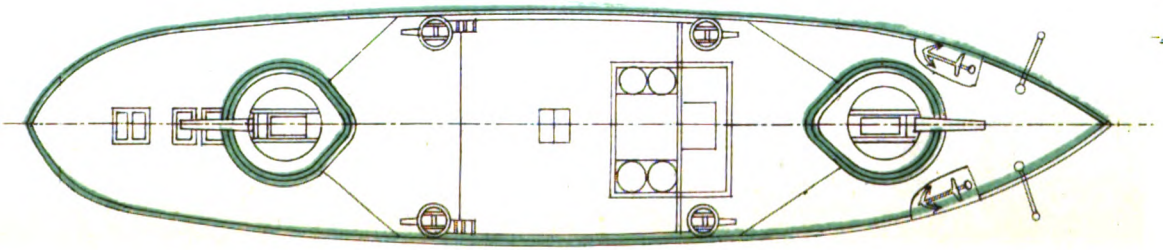
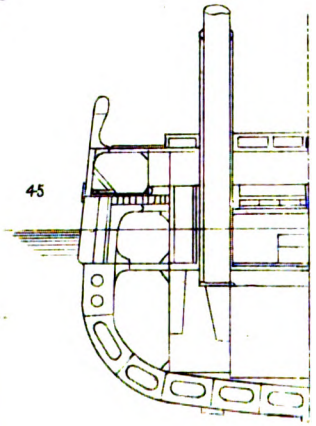
"Caiman".
"Indomptable".
"Requin".
"Terrible".









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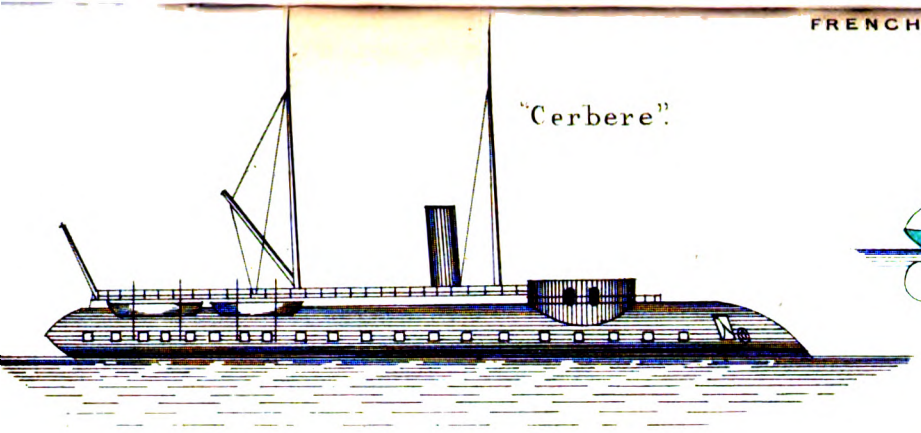
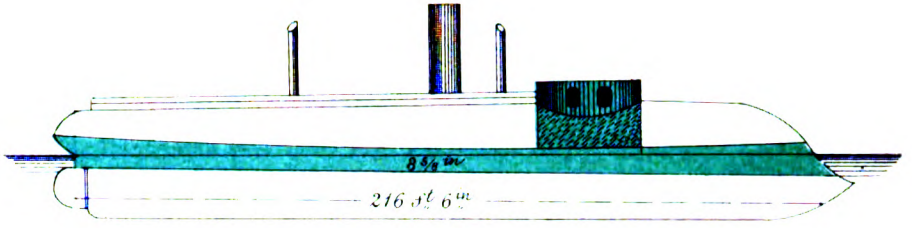
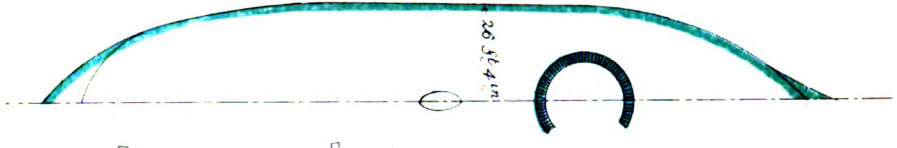
Pl. 69.

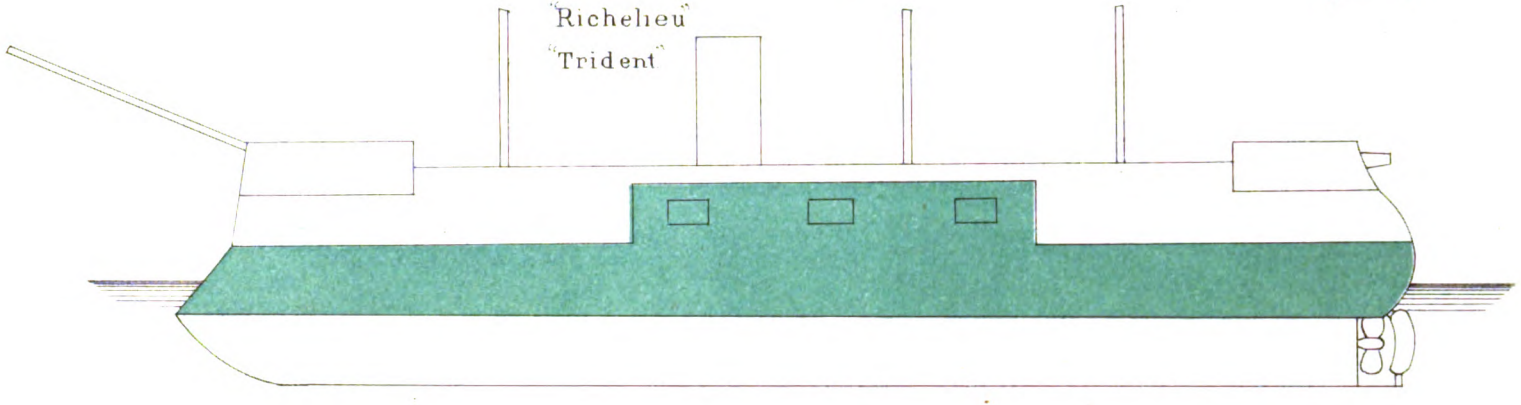
"Cerbere".







"Colbert".
"Richelieu"
"Trident"



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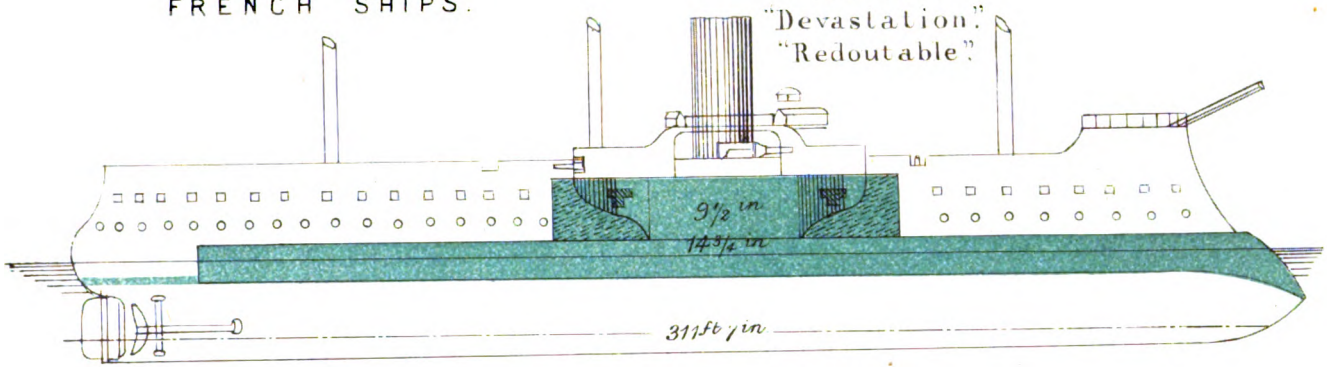
FRENCH SHIPS.

"Courbet".
"Devastation".
"Redoutable".



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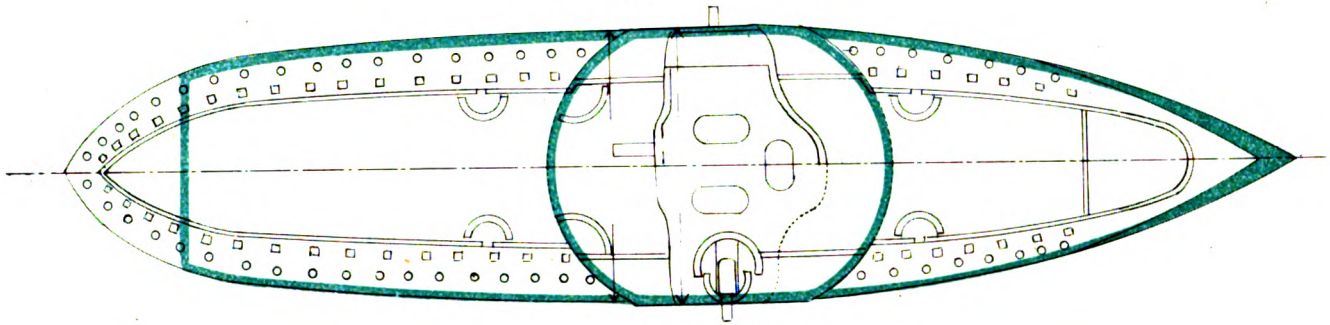

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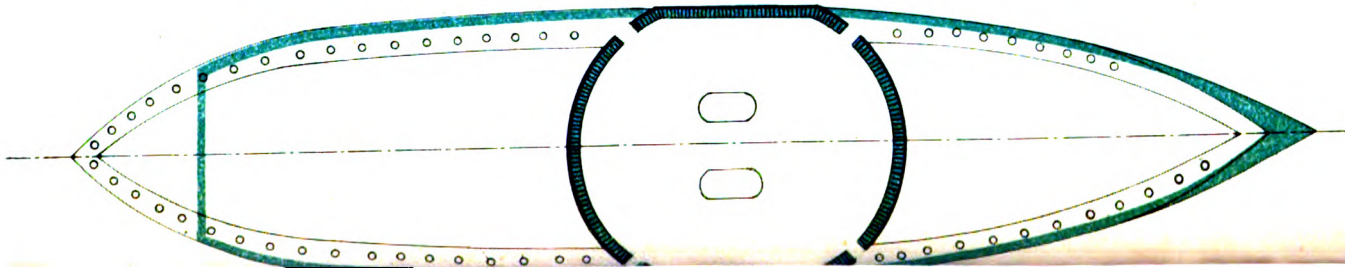

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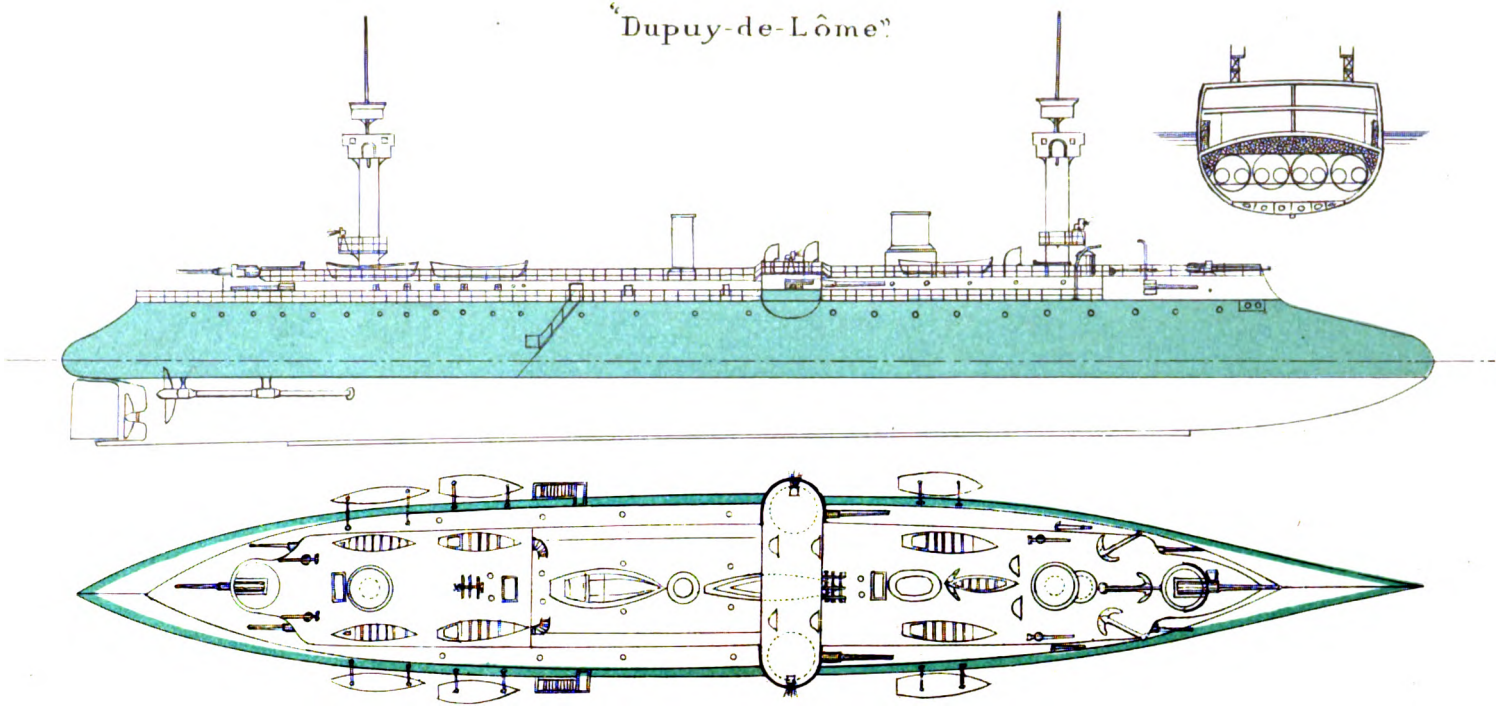
Armoured Cruiser.

"Dupuy-de-Lôme"



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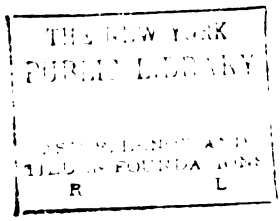
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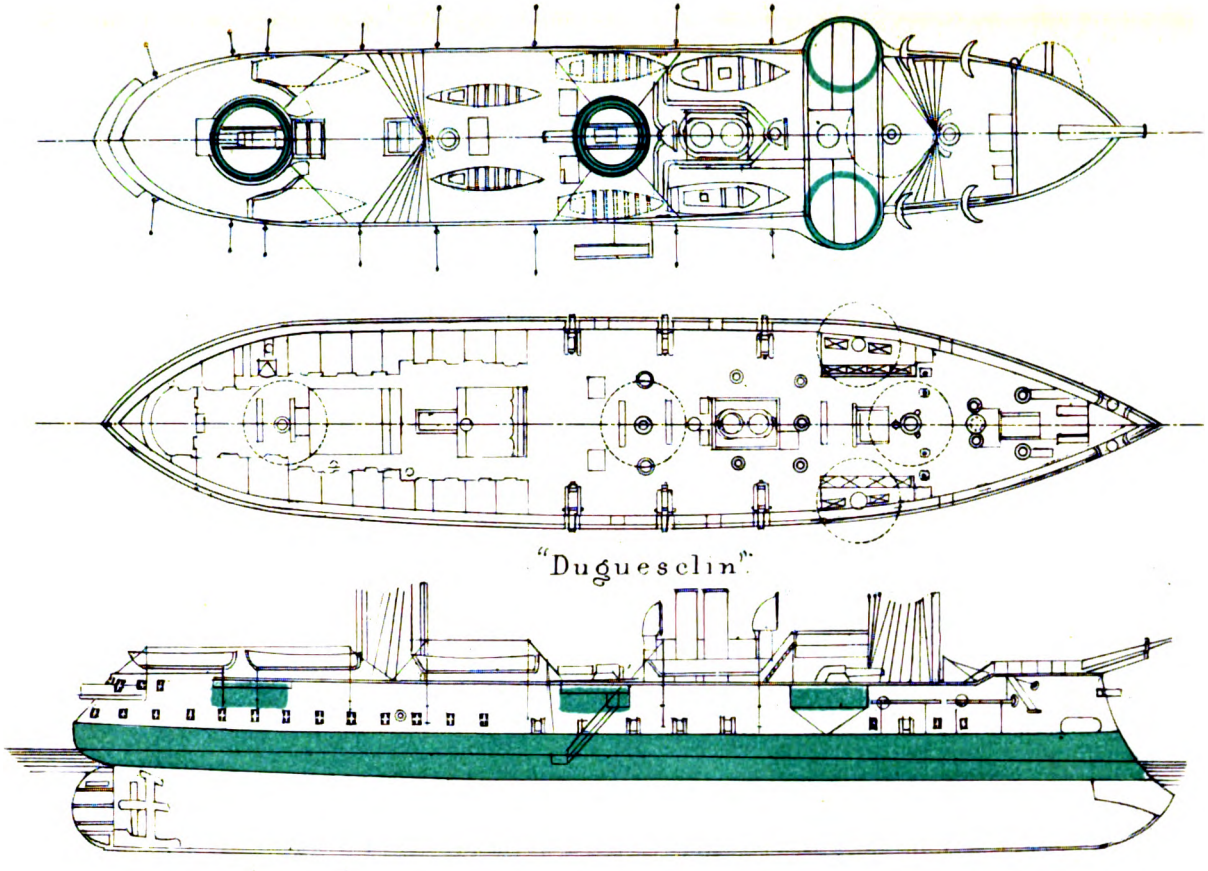

"Duguesclin".

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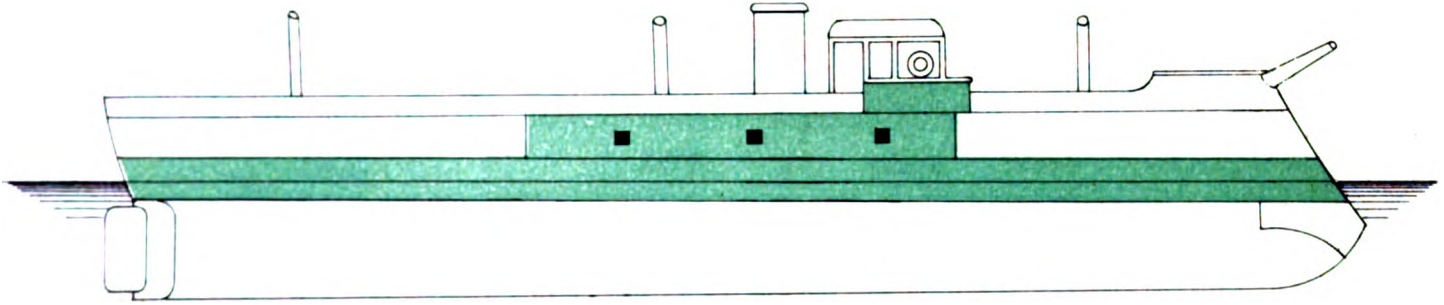
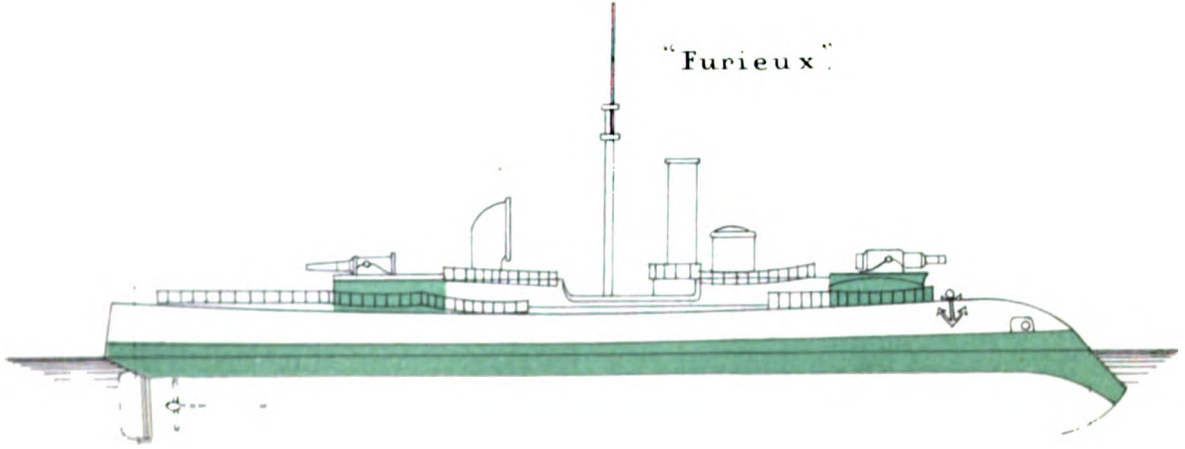
FRENCH SHIPS.

"Friedland".



"Furieux".



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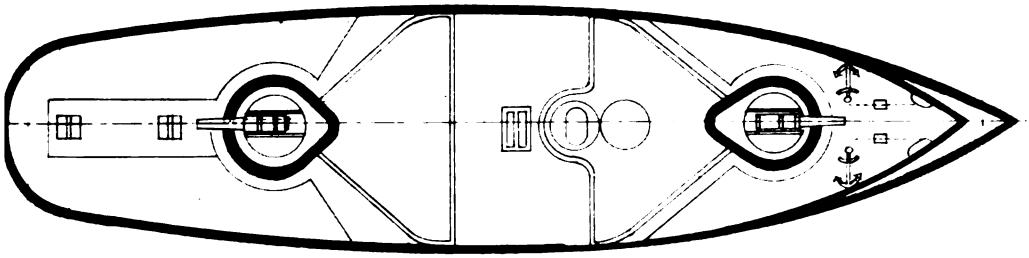
"Furieux"



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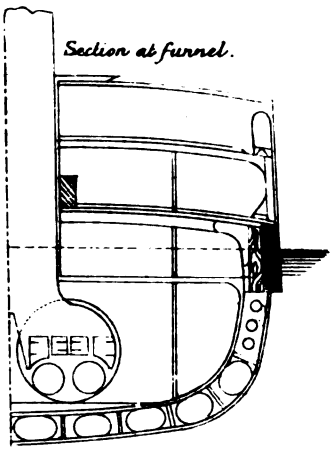

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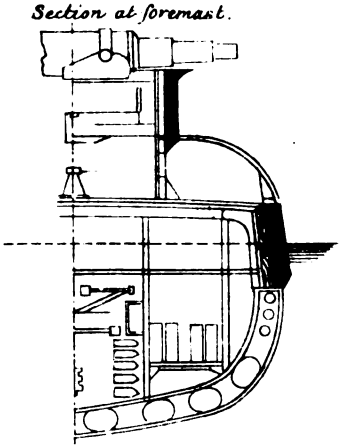
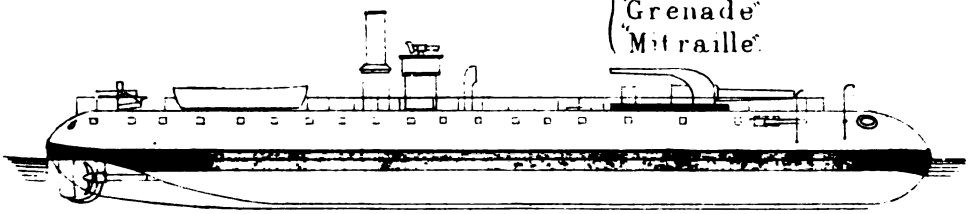
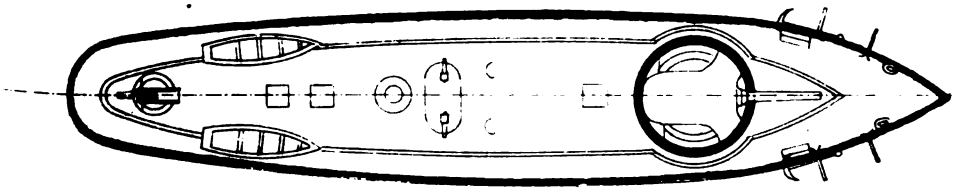
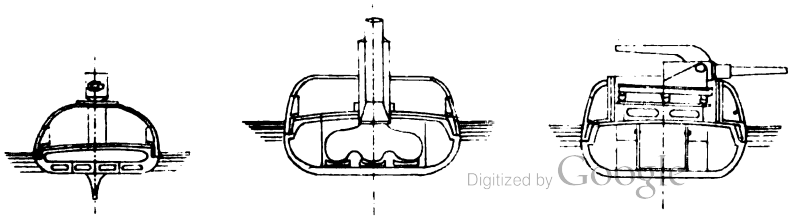


"Fusée" *Class* { "Flamme" "Fusée" "Grenade" "Mitraille"







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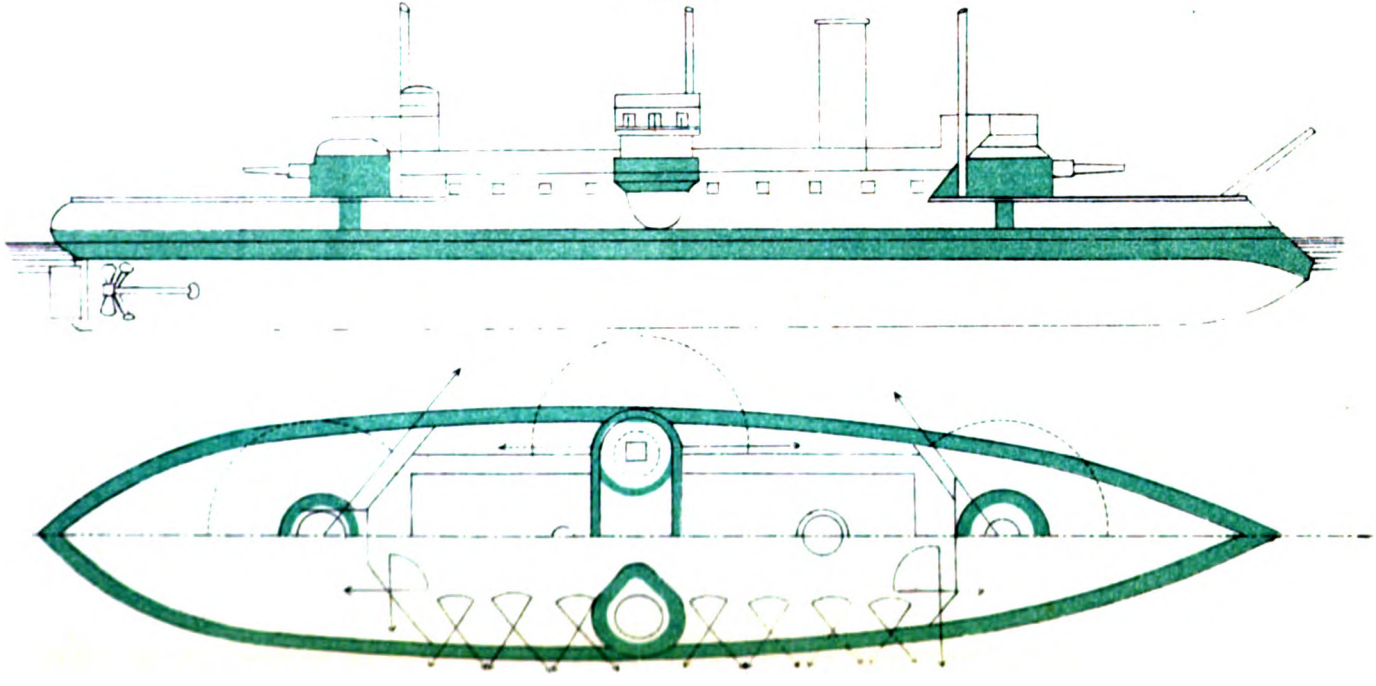
FRENCH SHIPS.

"Hoche"



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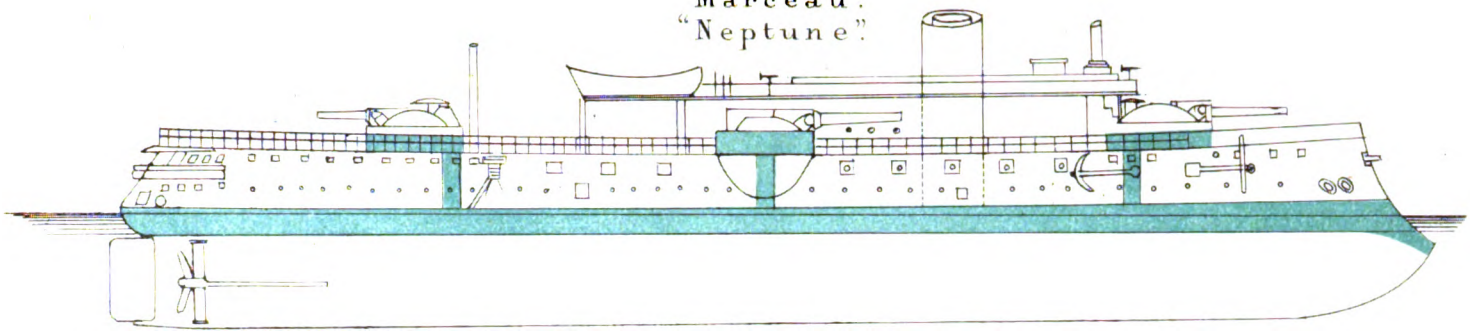
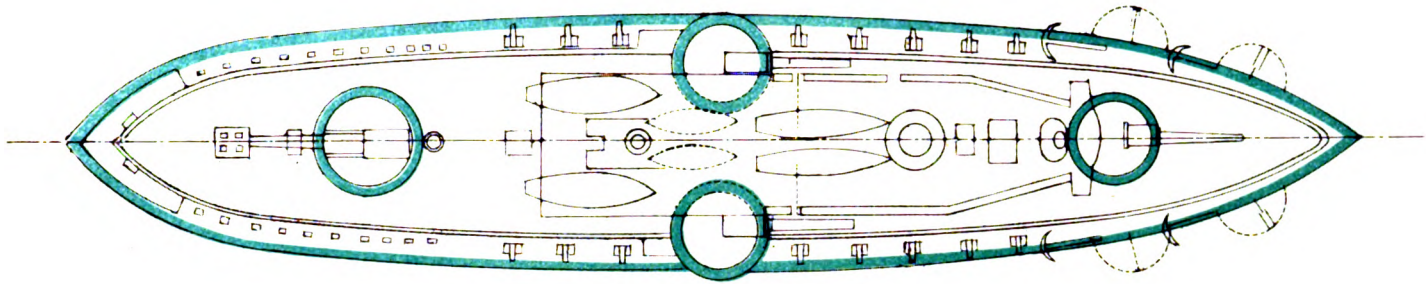
"Magenta."
"Marceau."
"Neptune."





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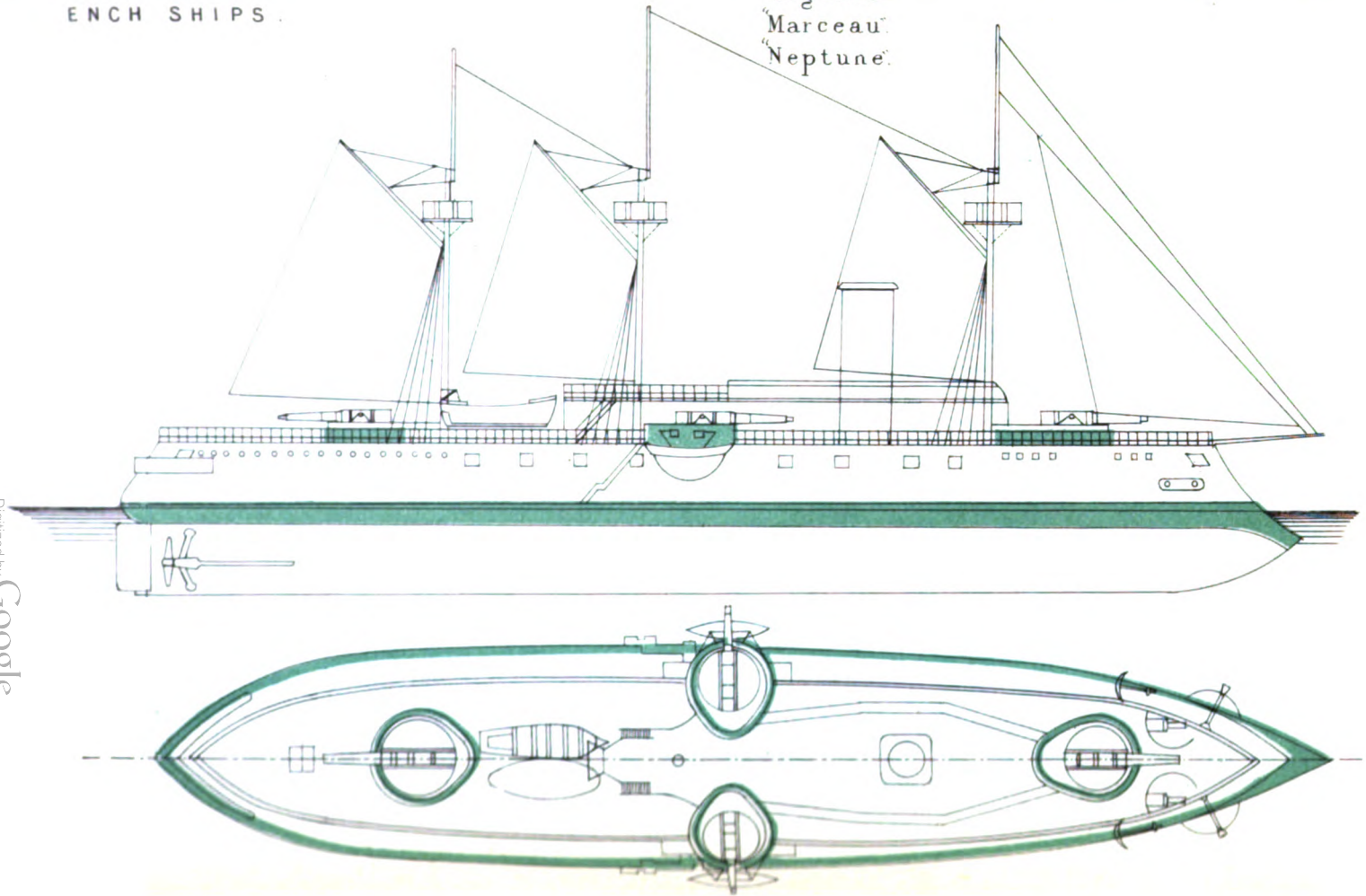
"Magenta"
"Marceau"
"Neptune"



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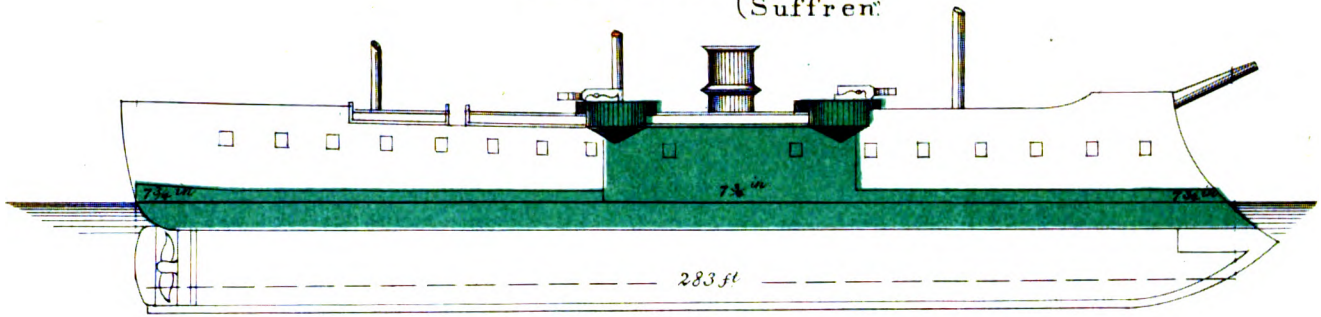
Ocean *Class* { "Marengo" / "Ocean" / "Suffren"



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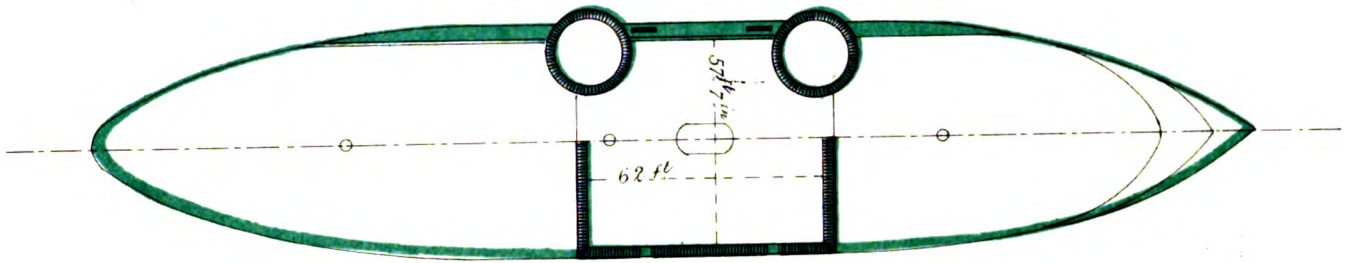

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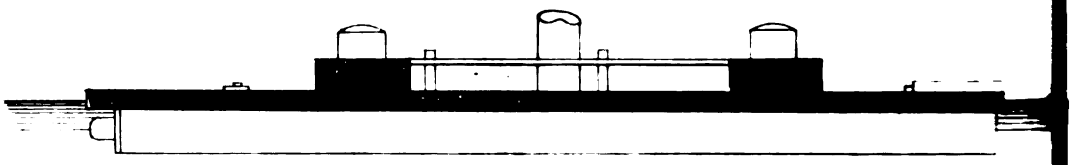
FRENCH SHIPS.

"Onondaga"



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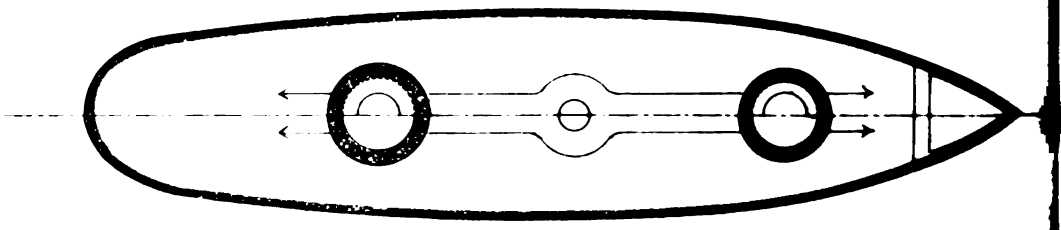
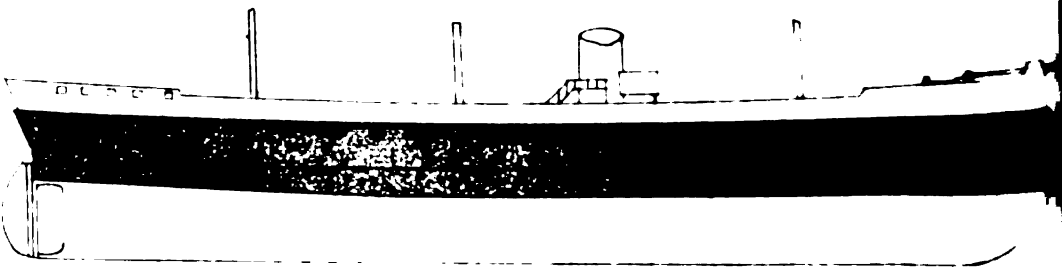
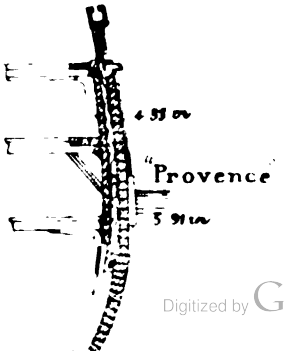


"Heroine"
"Provence"
"Revanche"
"Surveillante"
"Valeureuse"





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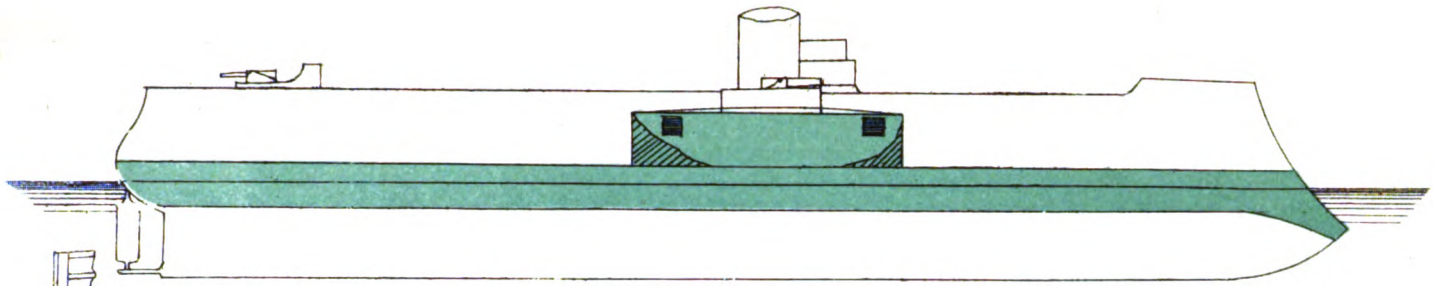
"Redoutable"

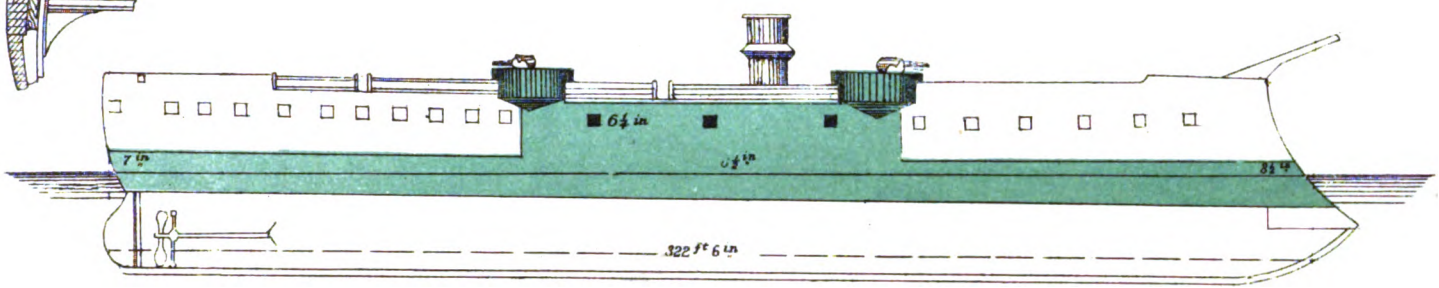


Redoutable

6·3 in

7 in

"Richelieu"



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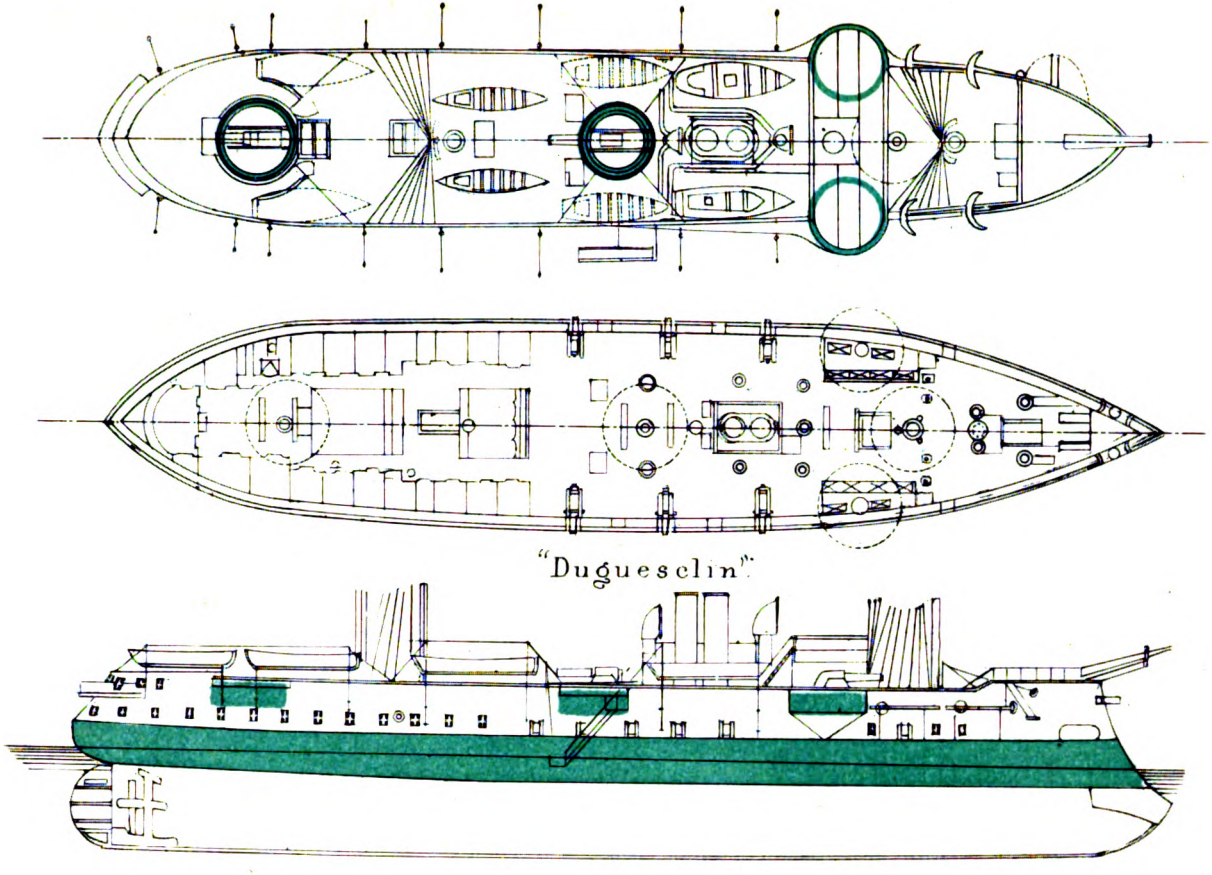

"Duguesclin"

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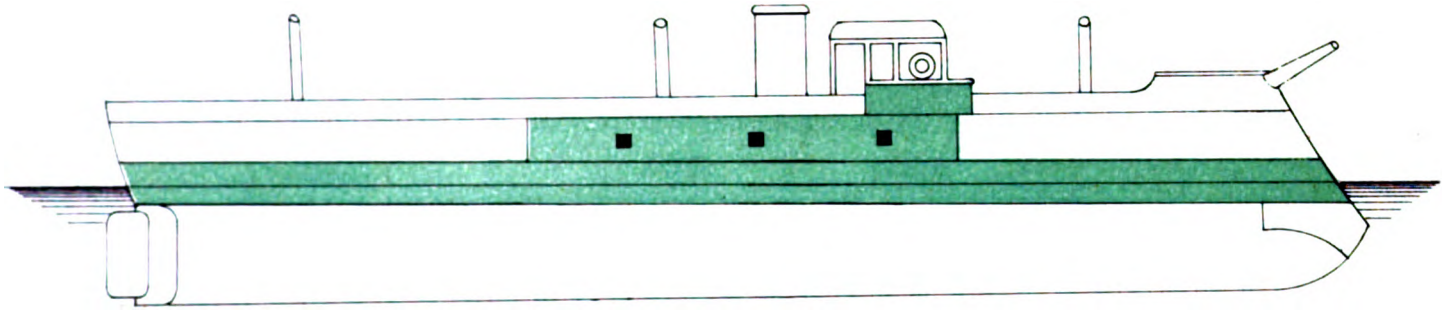
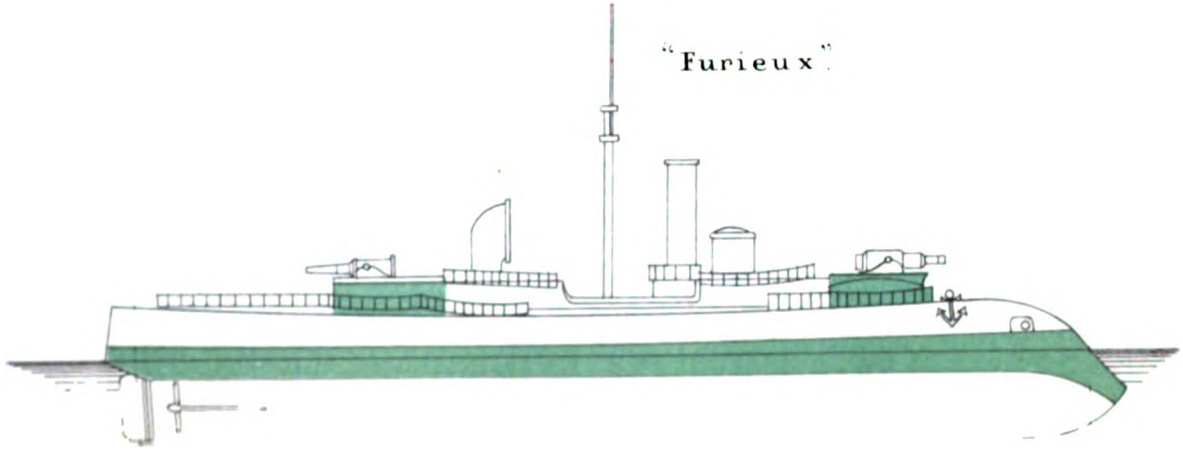
FRENCH SHIPS.

"Friedland".



"Furieux".



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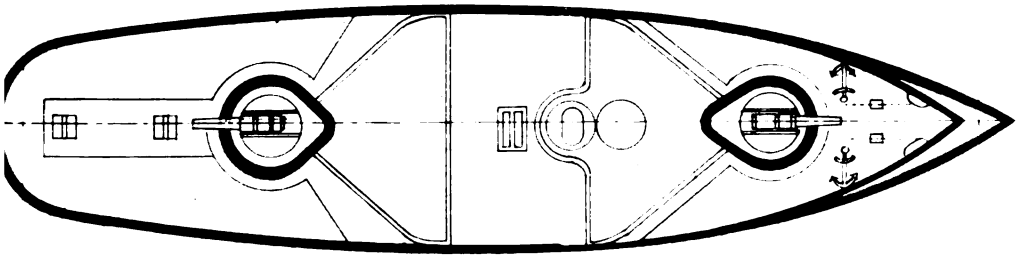
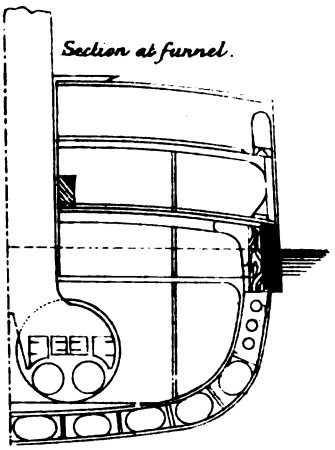
FRENCH SHIPS.

"Furieux"



Section at funnel.



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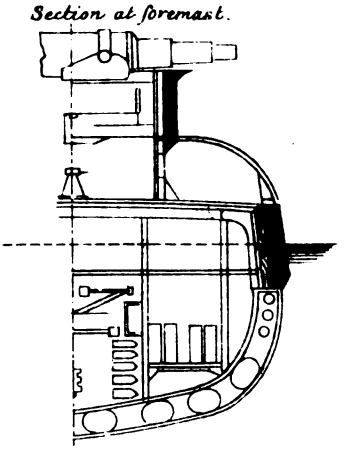
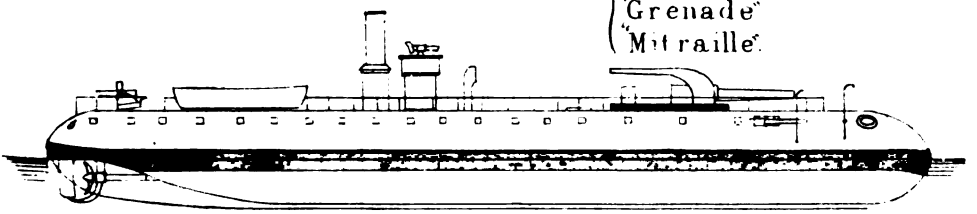
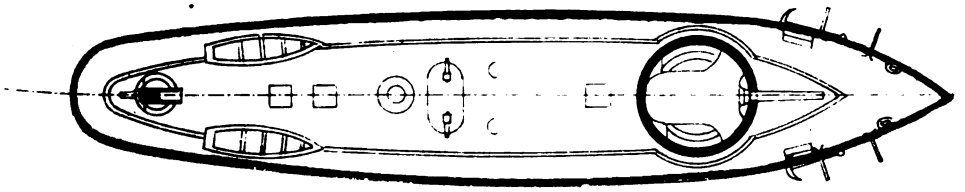
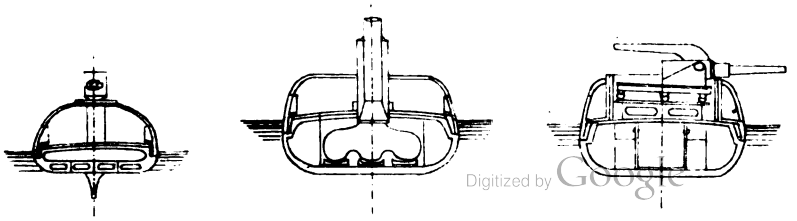


"Fusée" *Class* { "Flamme" "Fusée" "Grenade" "Mitraille"







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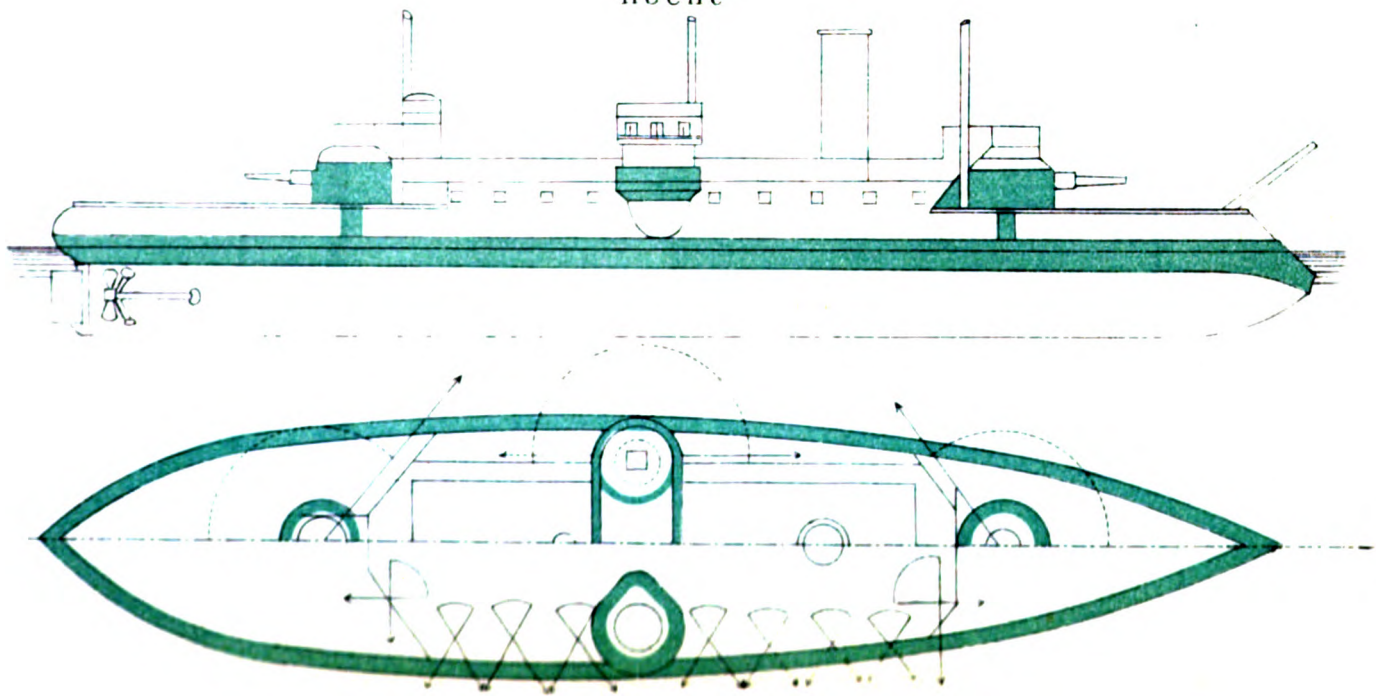
FRENCH SHIPS.

"Hoche"



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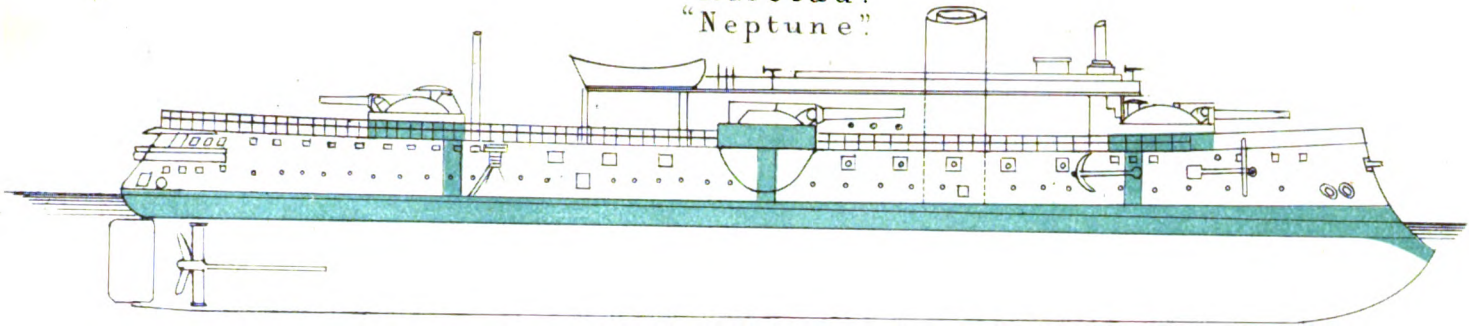
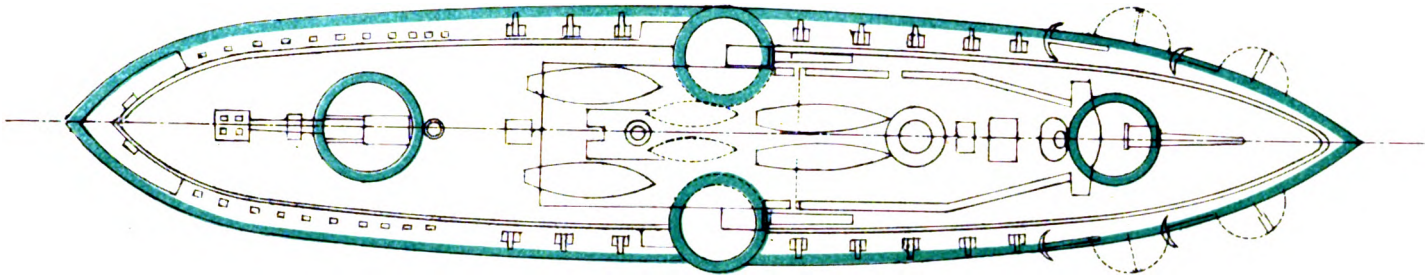
"Magenta."
"Marceau."
"Neptune."





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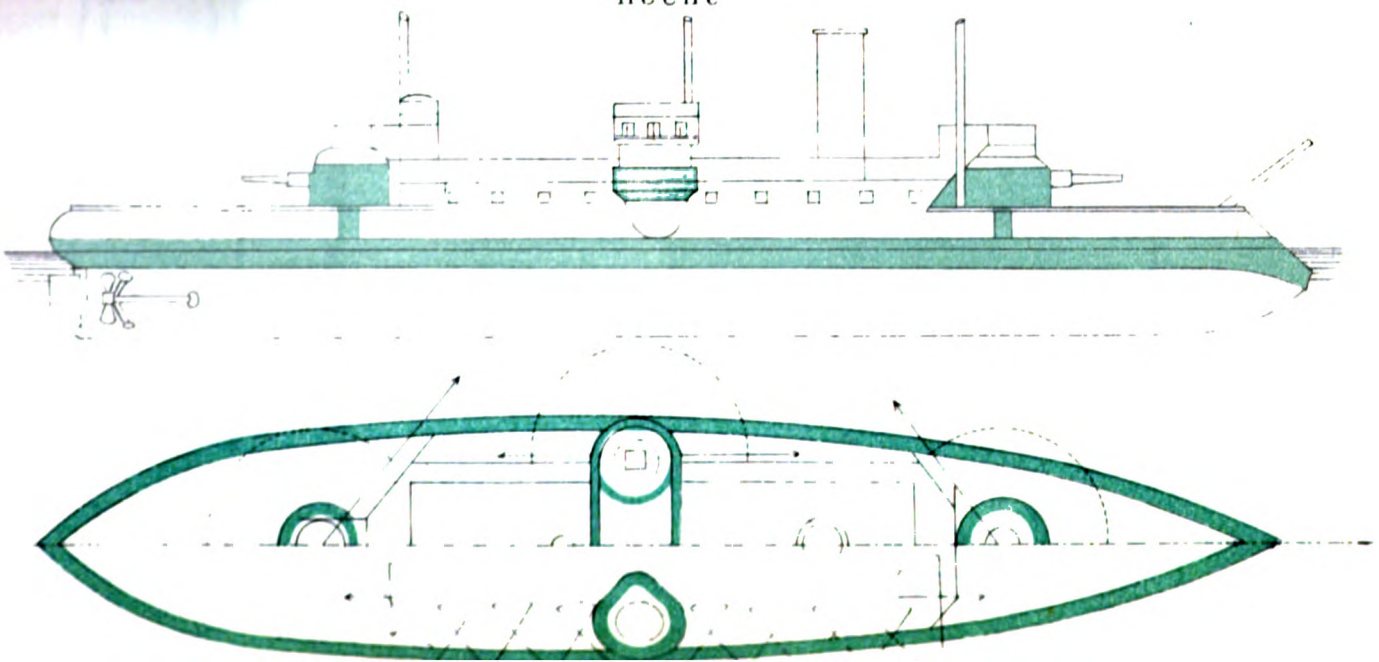
FRENCH SHIPS.

"Hoche"



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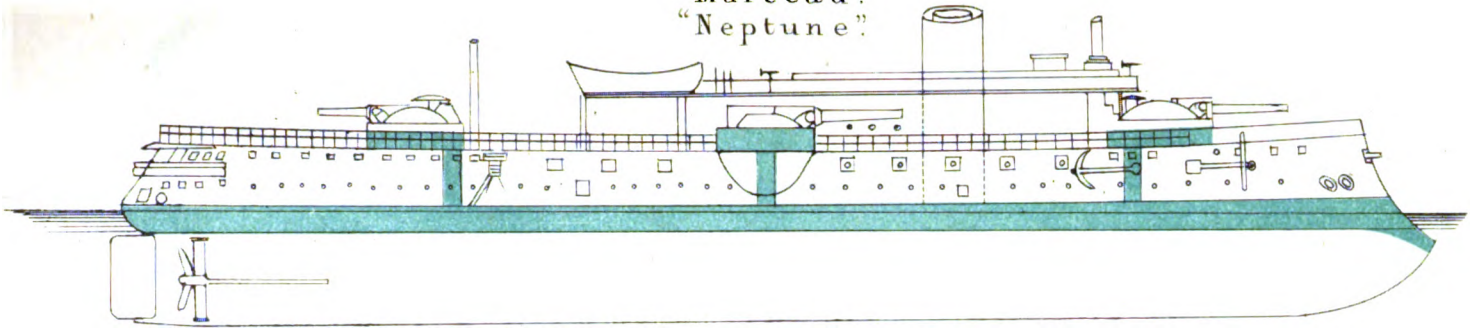
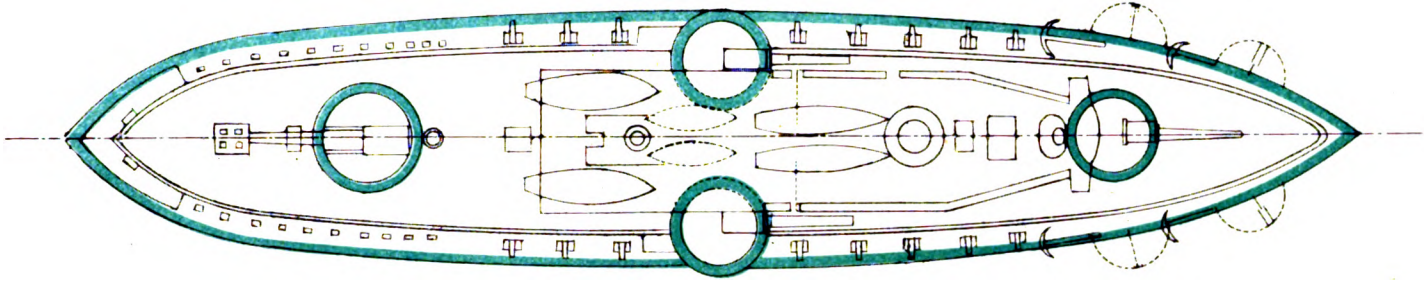
"Magenta."
"Marceau."
"Neptune."





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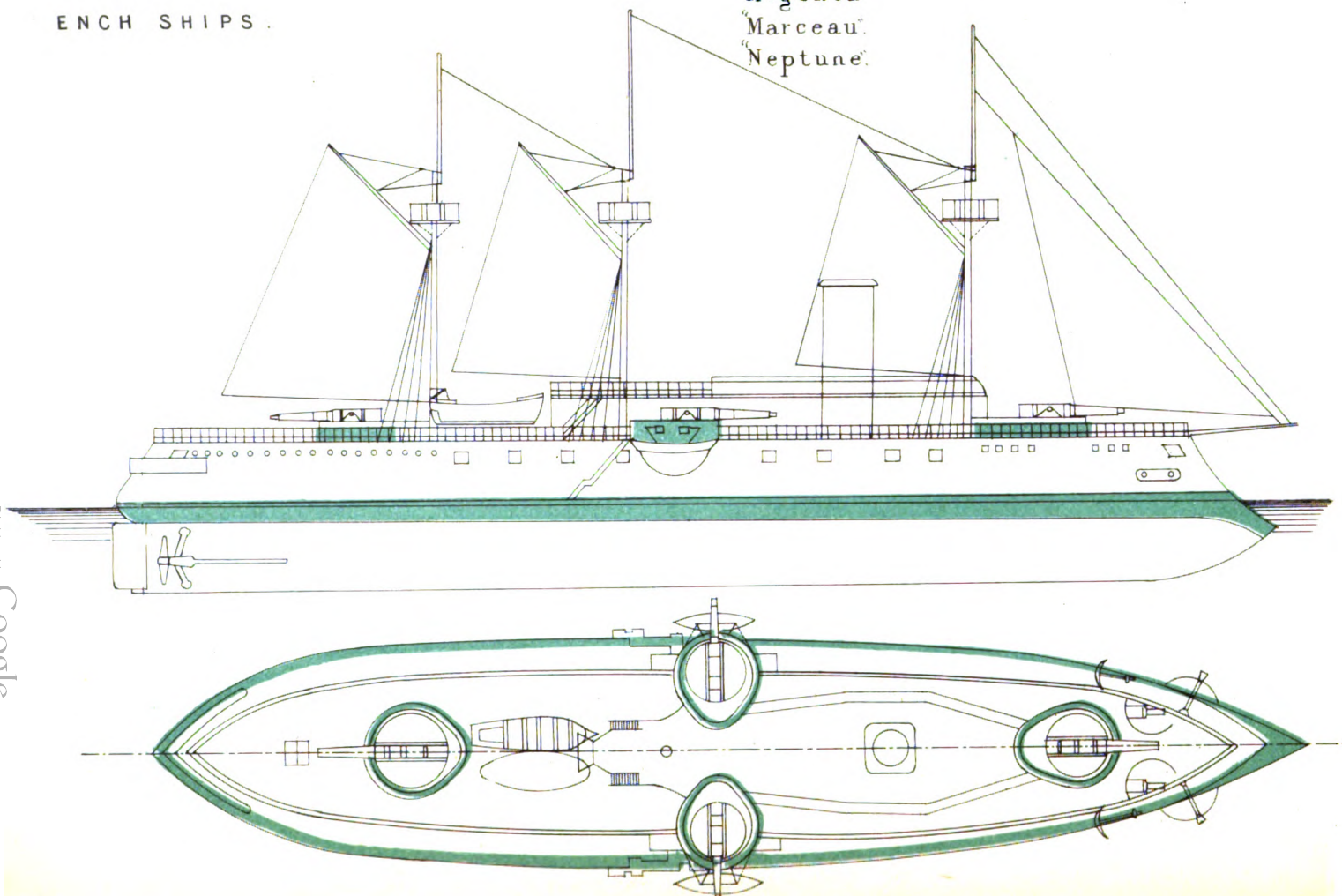
"Magenta"
"Marceau"
"Neptune"



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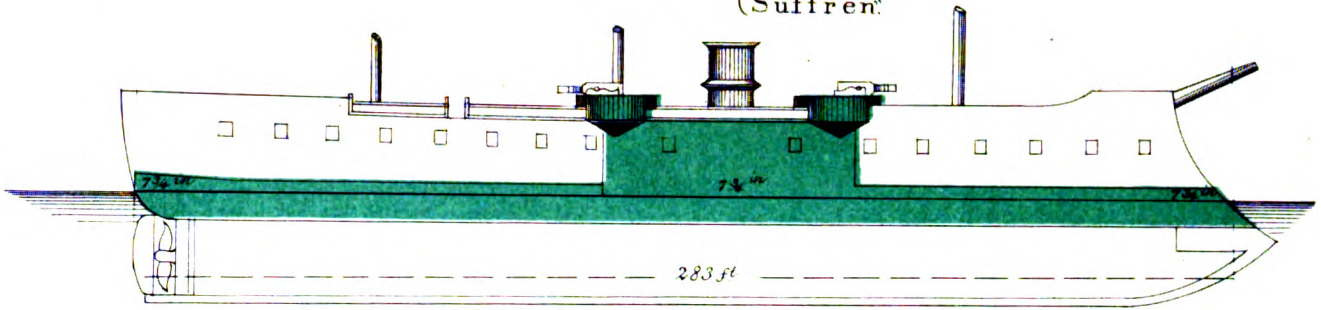
Ocean *Class* { "Marengo" / "Ocean" / "Suffren"



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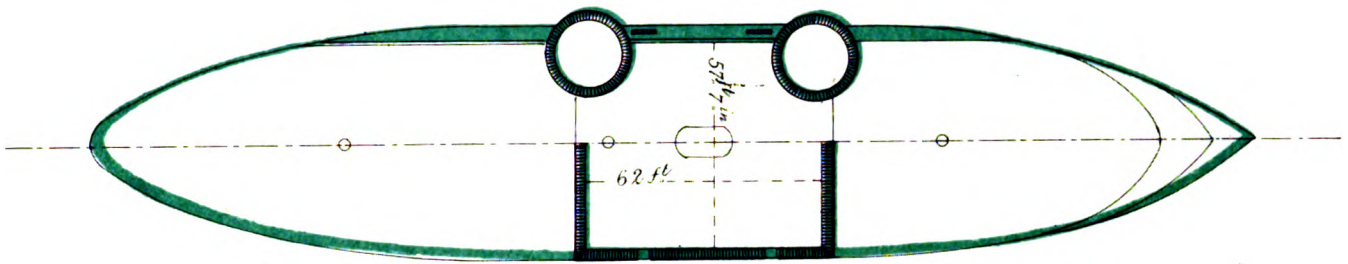

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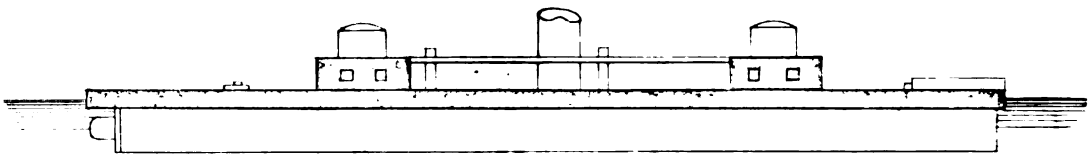
FRENCH SHIPS.

"Onondaga"



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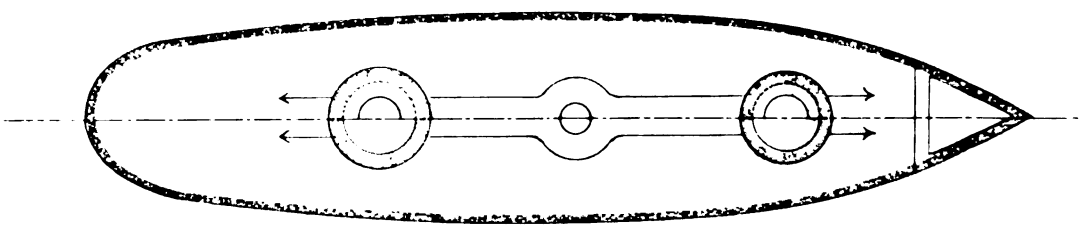
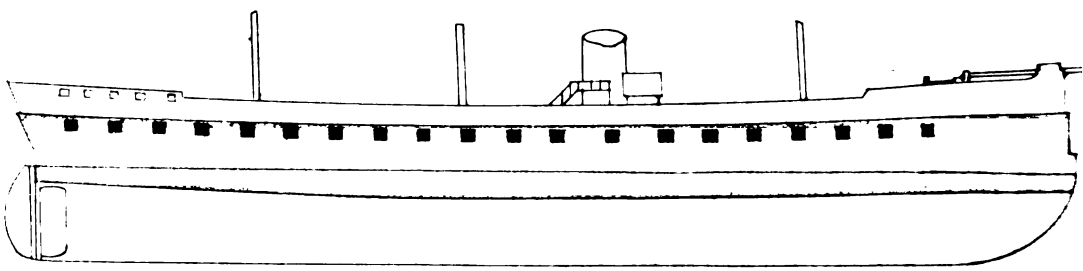
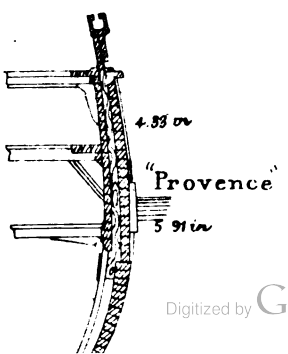


"Heroine"
"Provence"
"Revanche"
"Surveillante"
"Valeureuse"





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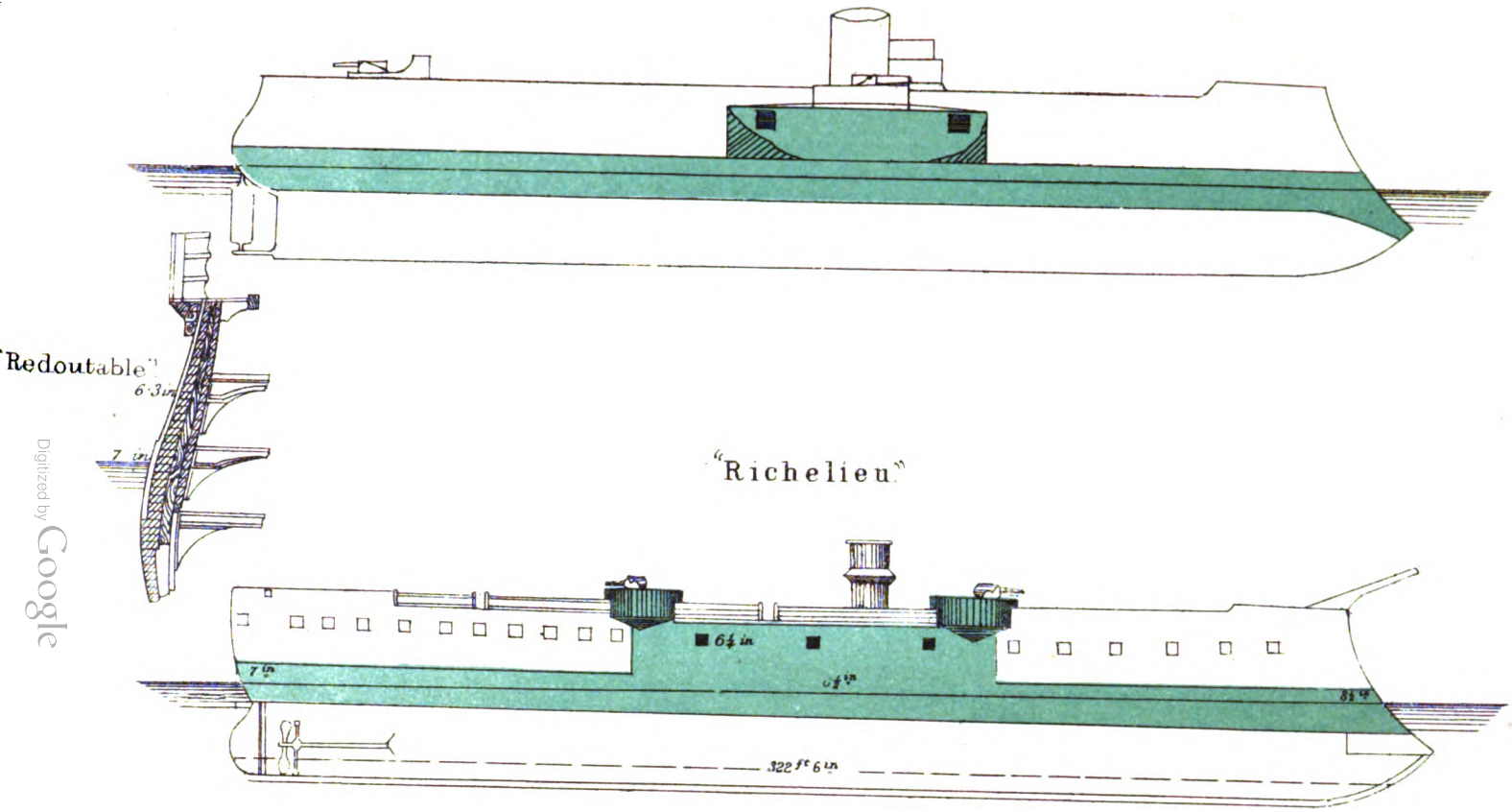

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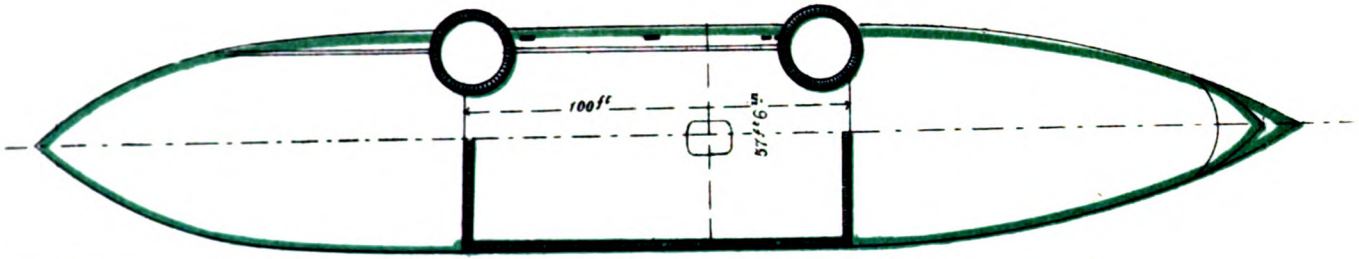
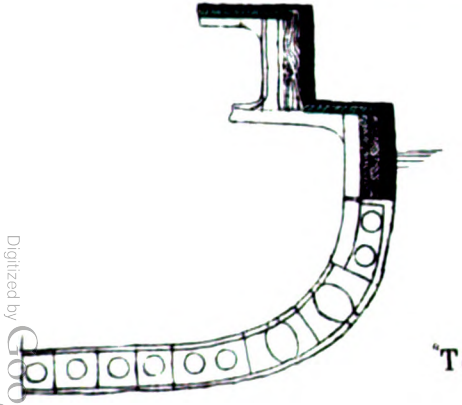
FRENCH SHIPS.

Pl. 80.

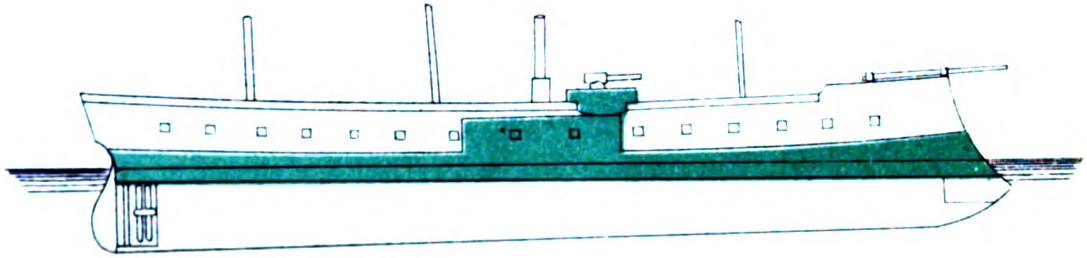


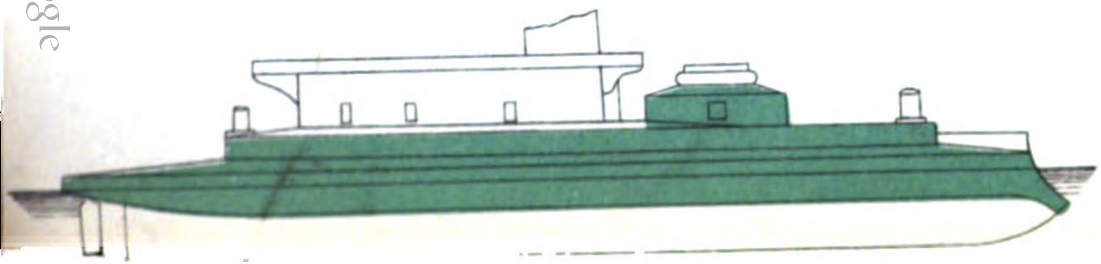
"Richelieu".



"Tonnerre".

"Thétis".





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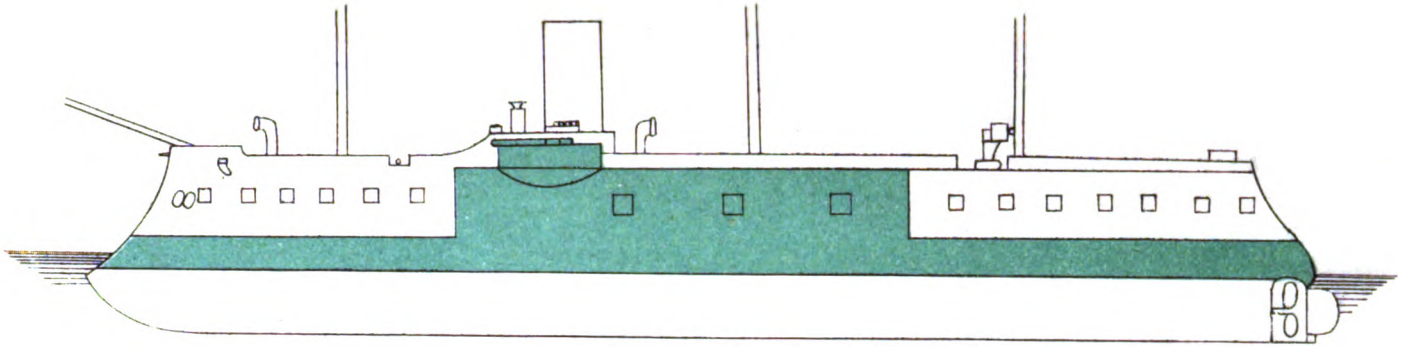
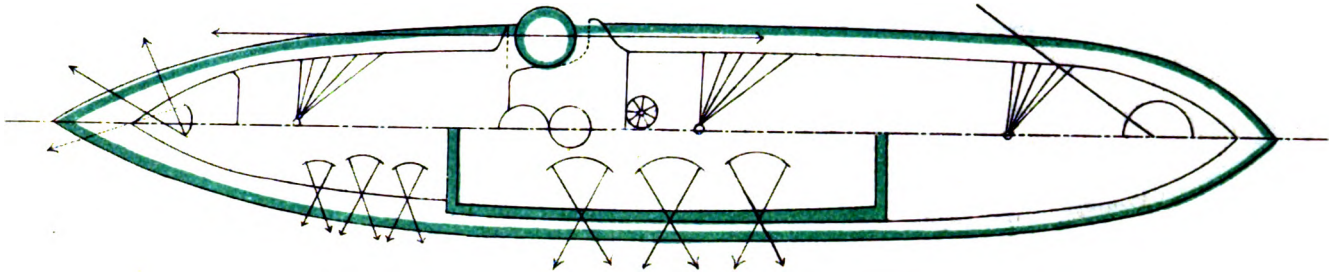
"Trident."





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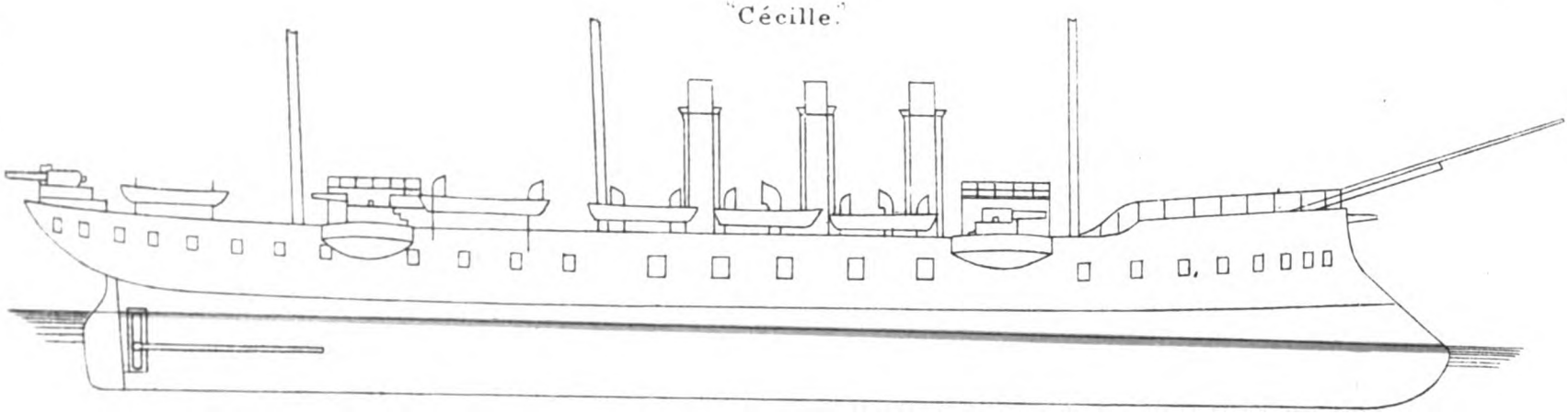
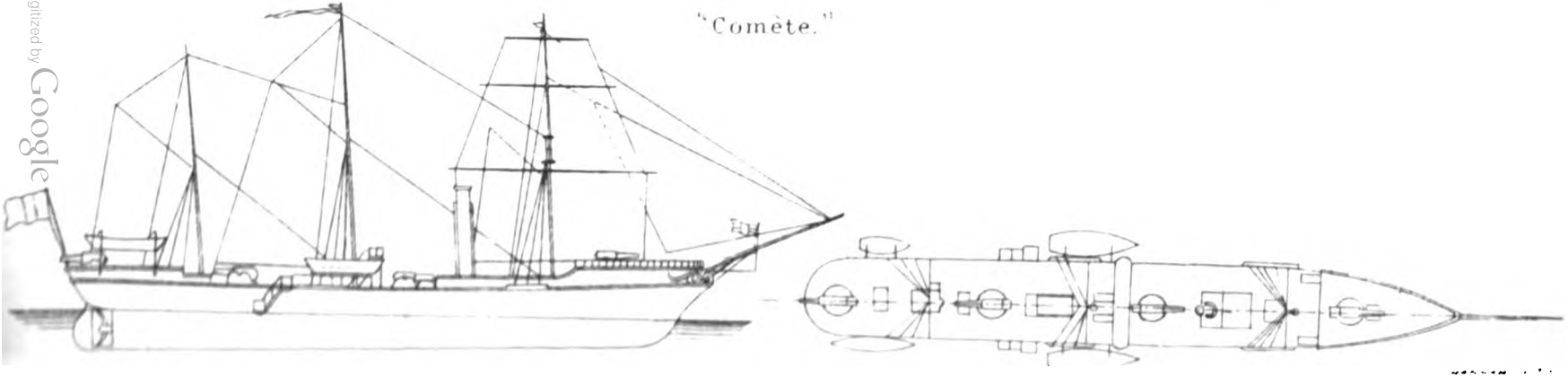
FRENCH SHIPS.

"Cécille."



"Comète."



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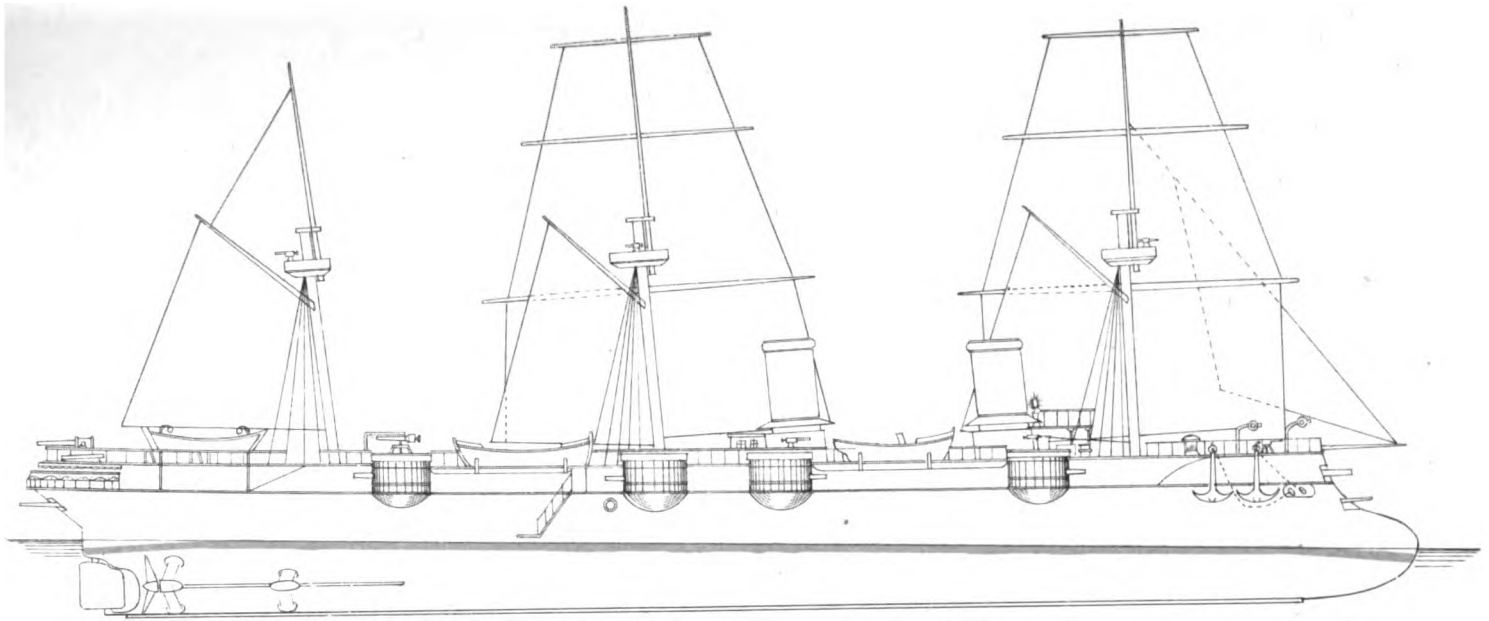
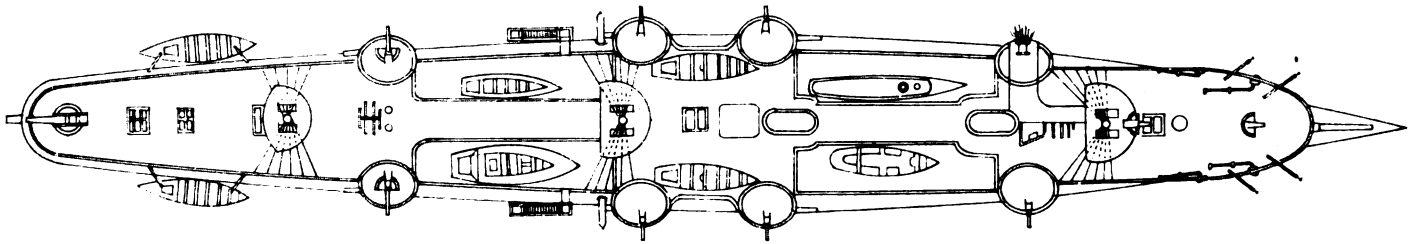
Alger.





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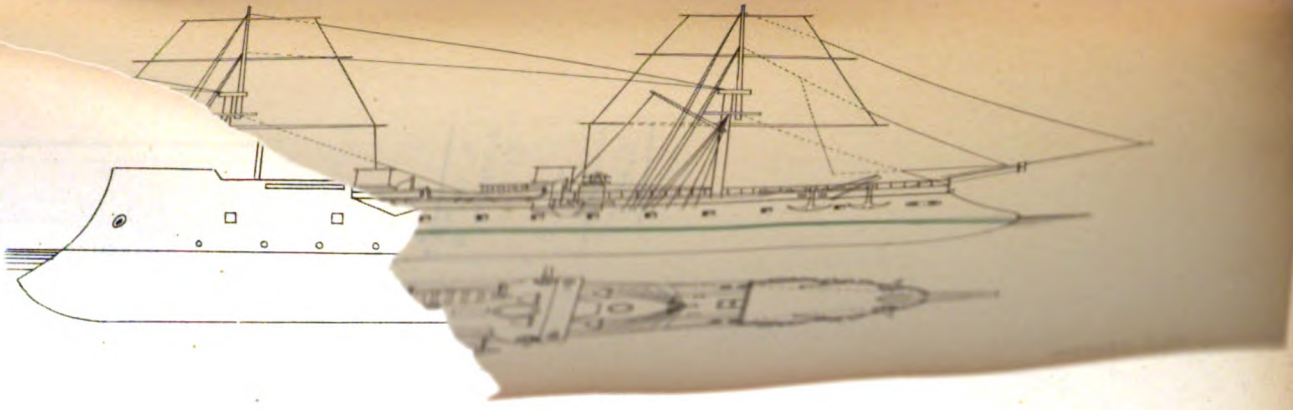
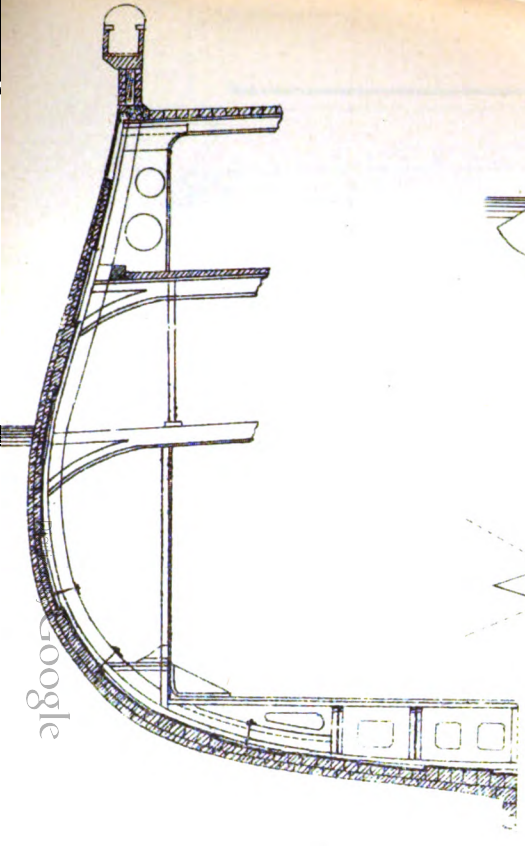
"Isly" & "Jean-Bart"





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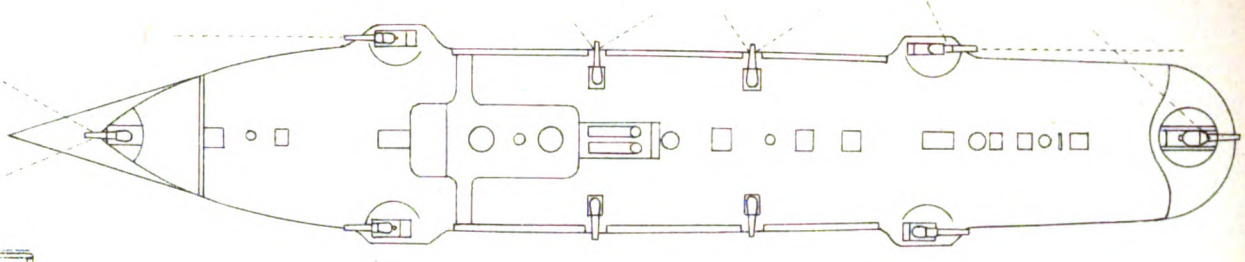

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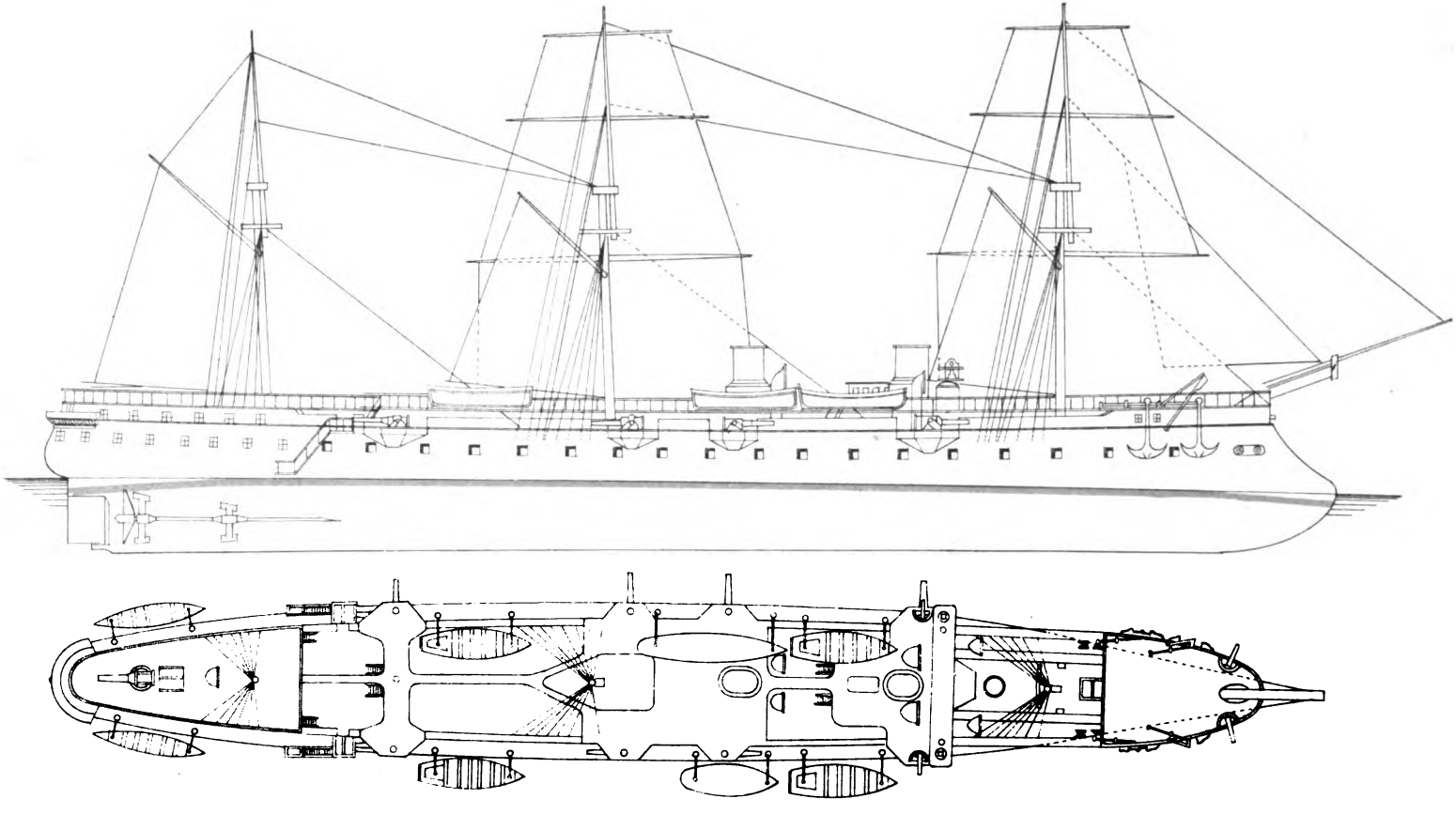

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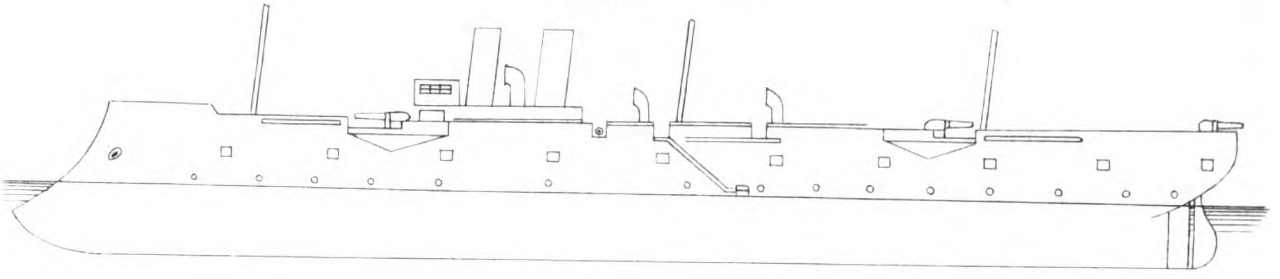

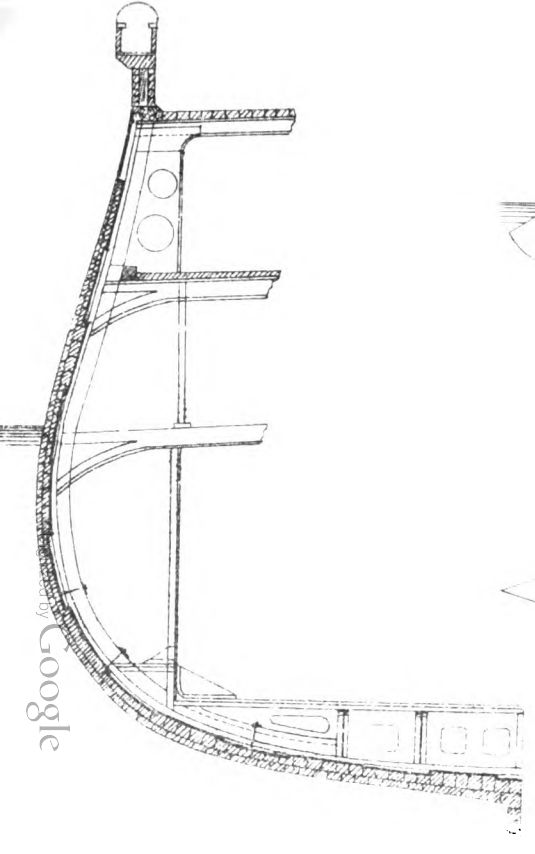

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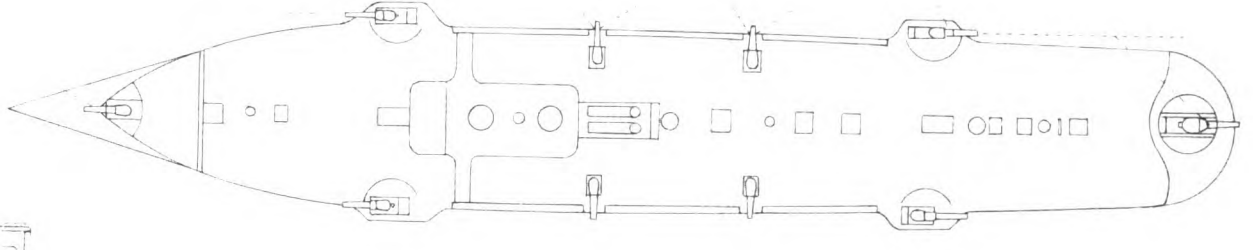

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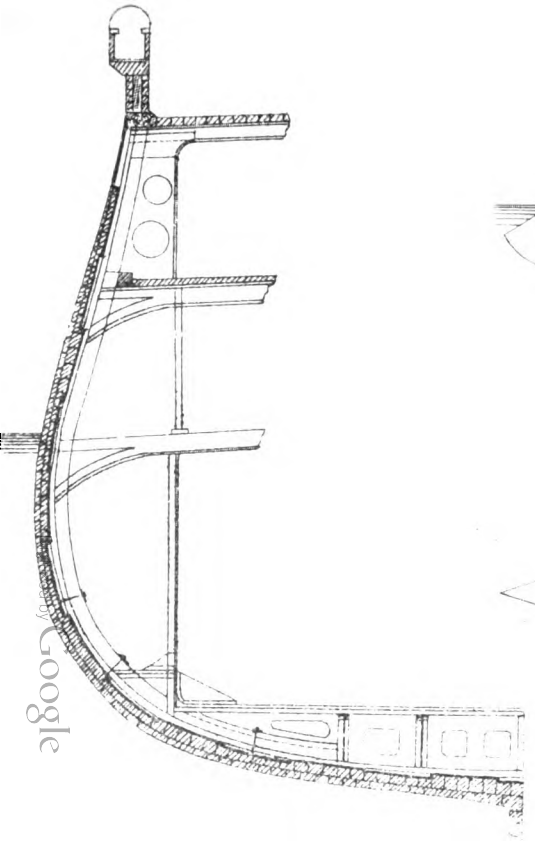

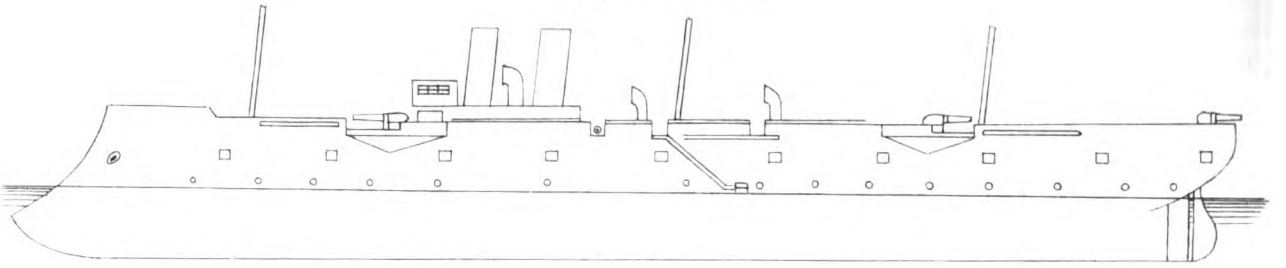

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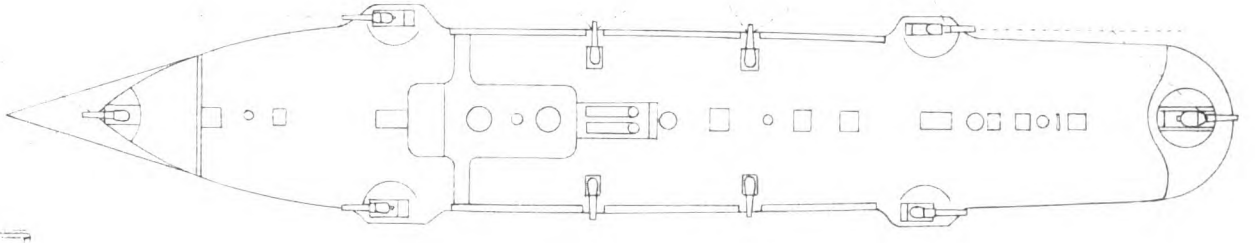

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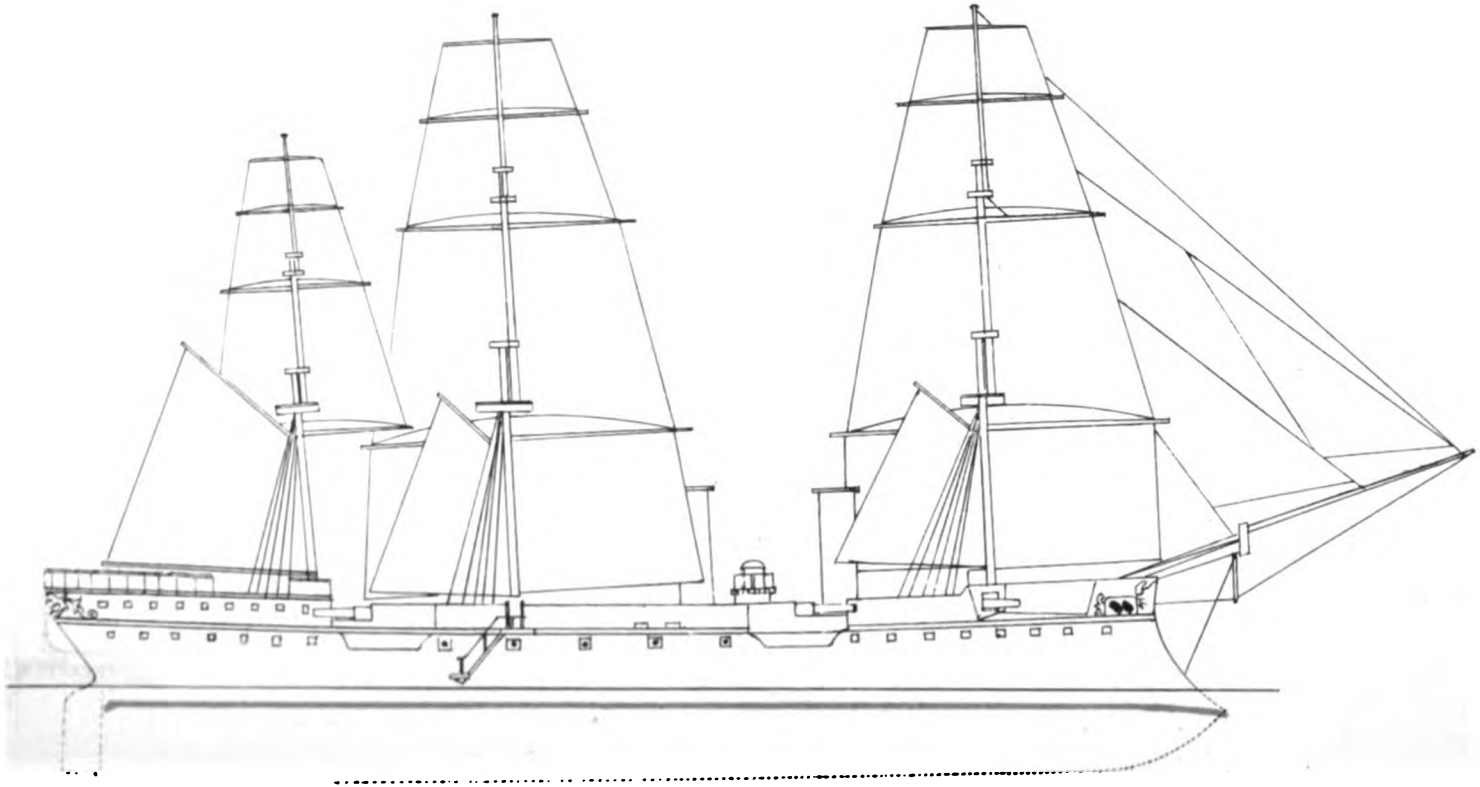
"Sfax" (Cruiser)



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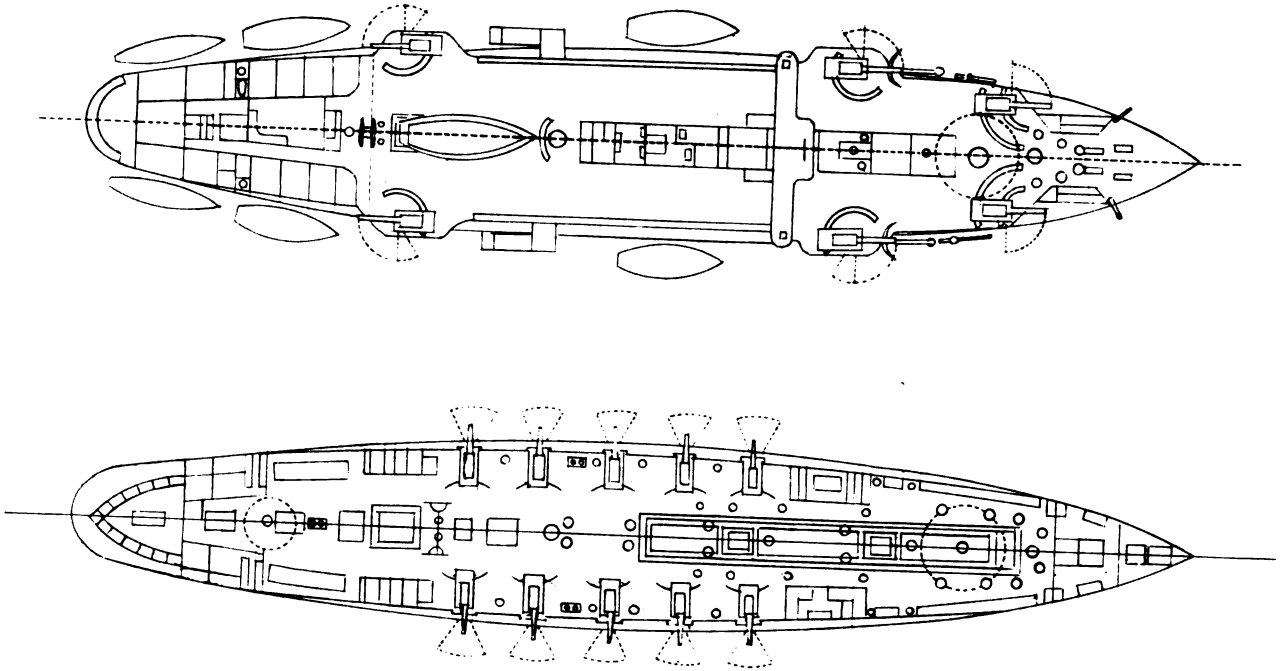
FRENCH SHIPS.

"Sfax" (Cruiser)



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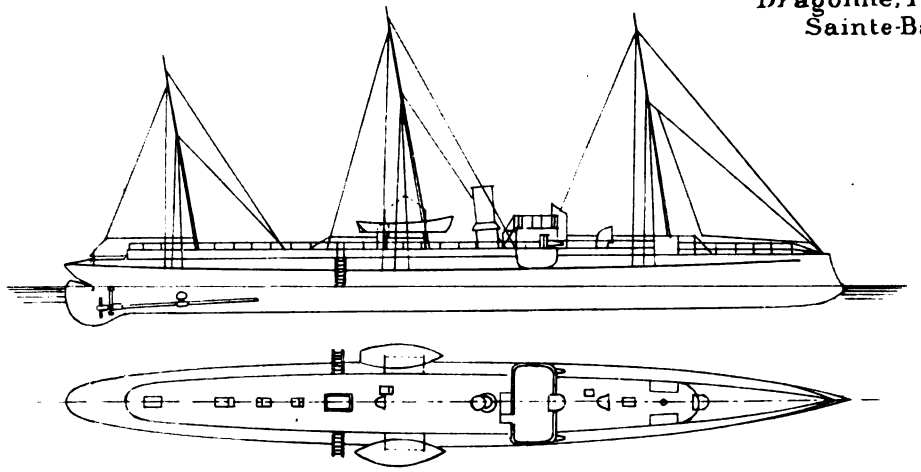
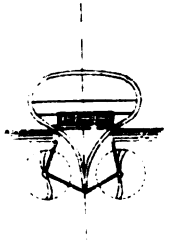
HANHART LITH

"Bombe, Couleuvrine, Dague."
Dragonne, Flèche, Lance,
Sainte-Barbe. Salve.





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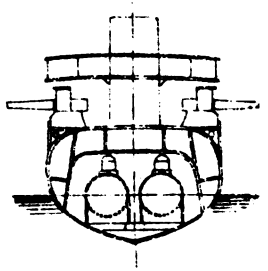

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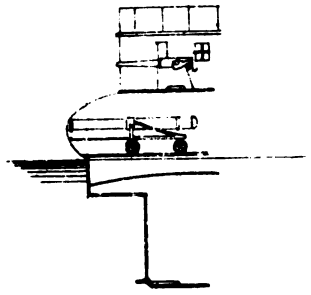

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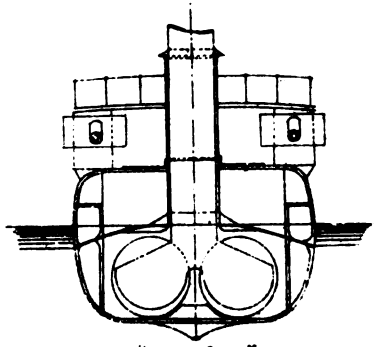
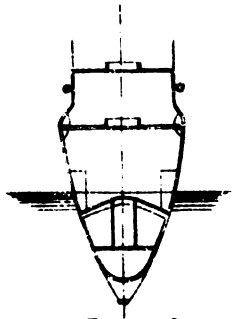


"Condor"
Before the Engine Room.



Forward.

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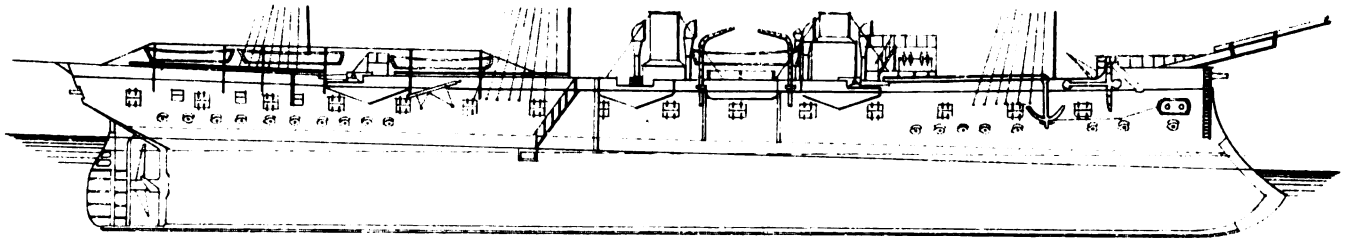
"Duquesne"



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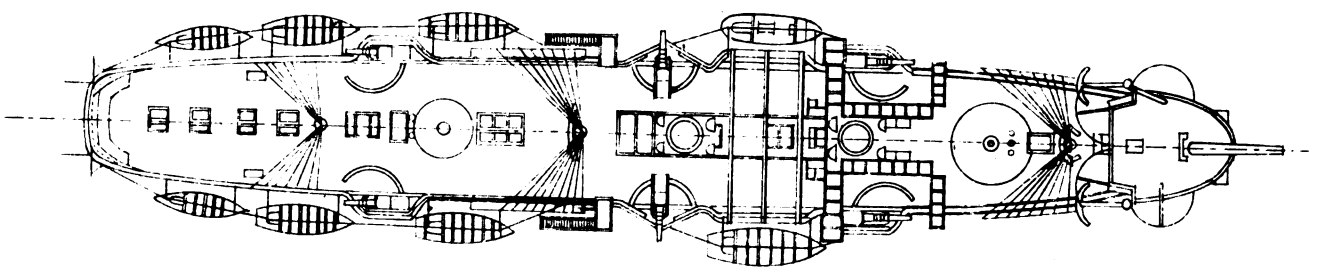

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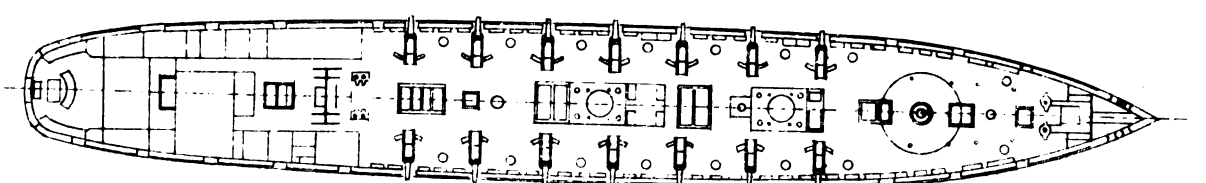

(Main Deck.)

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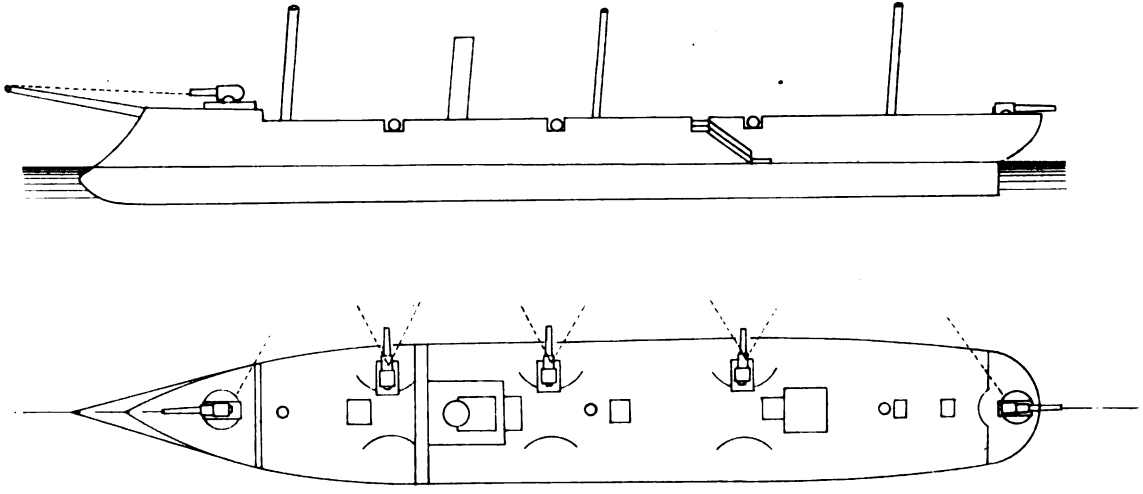
"Eclaireur."



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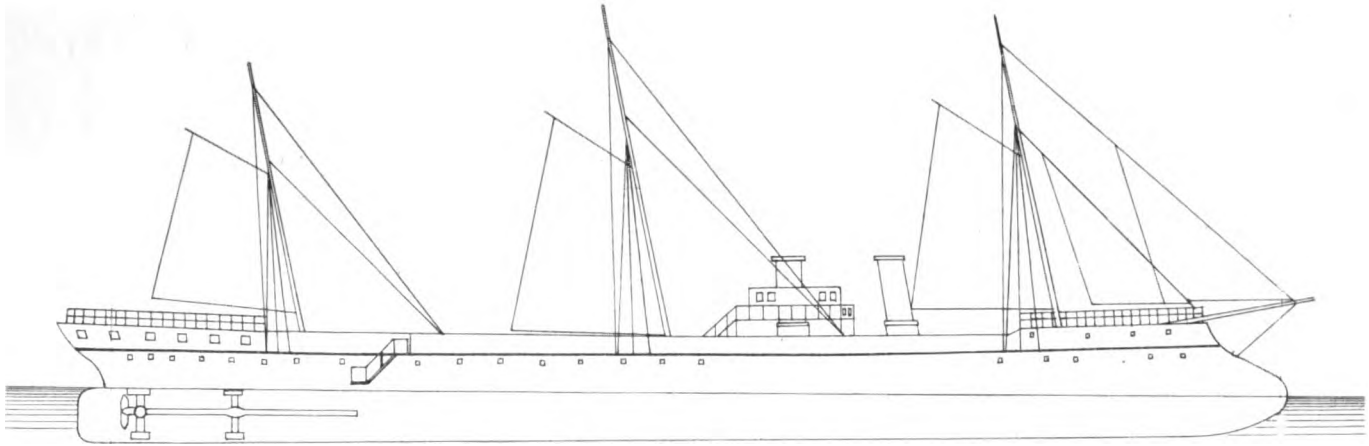
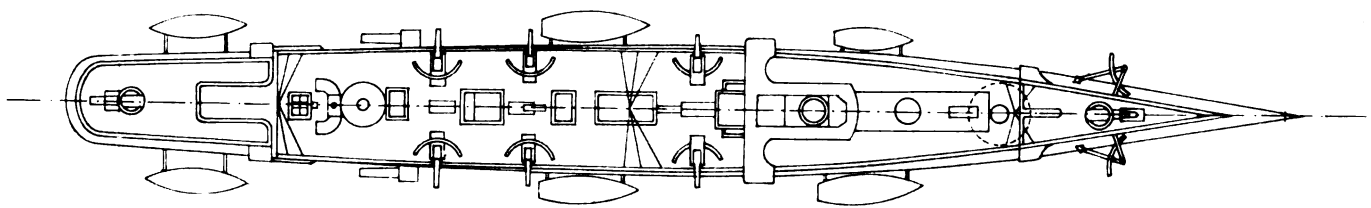
"Milan."





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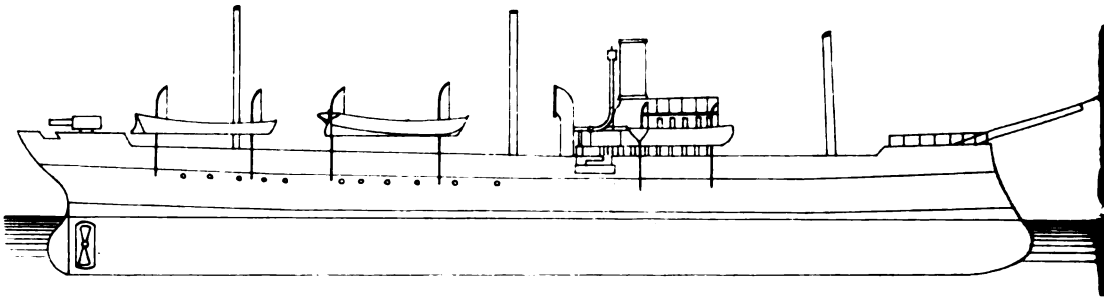
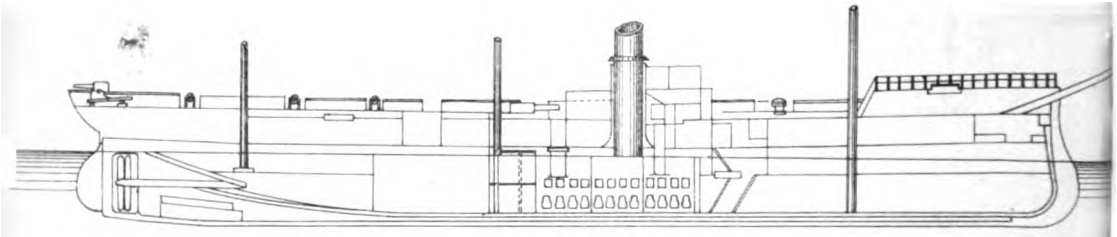
FRENCH SHIPS.

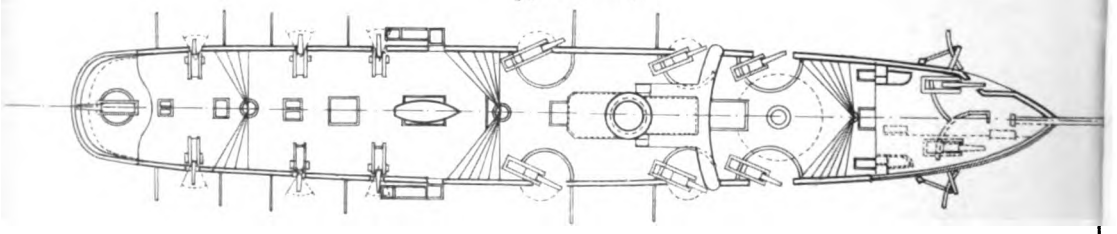
"Roland."



"Villars."



"Villars."
(Upper Deck.)



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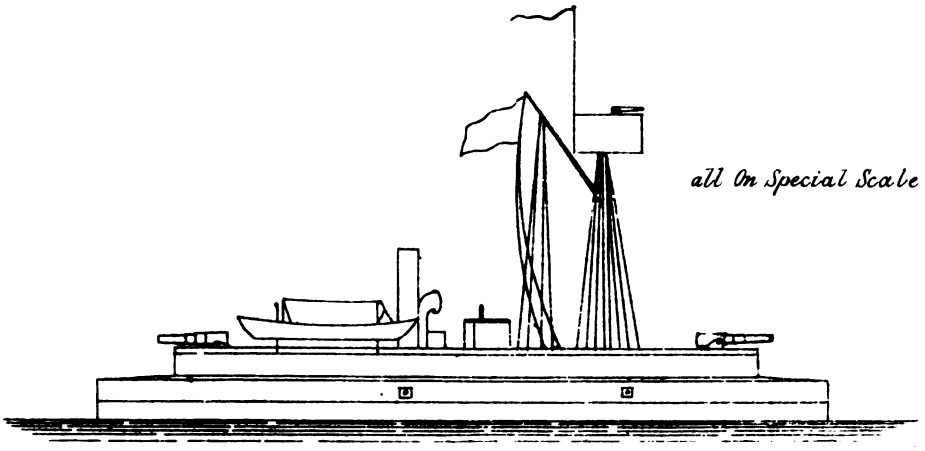
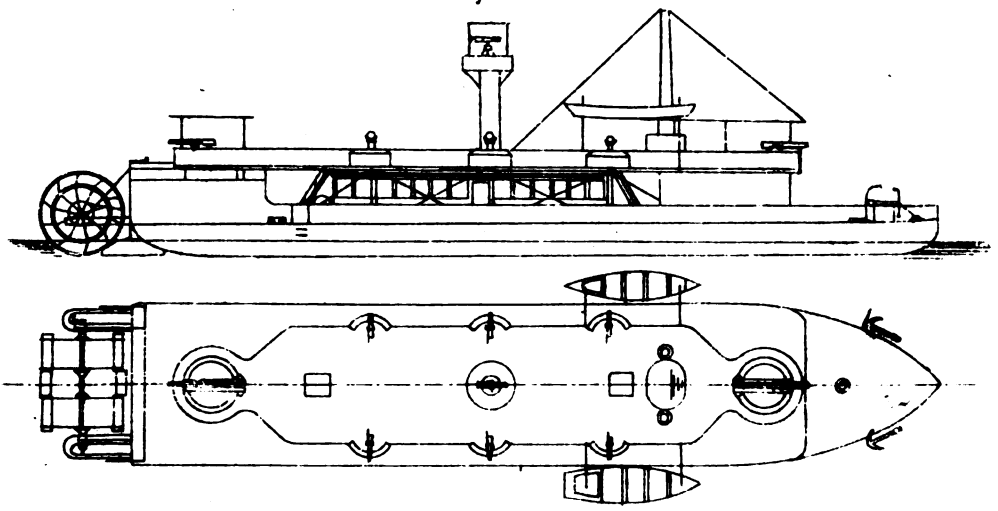
"Arquebuse."

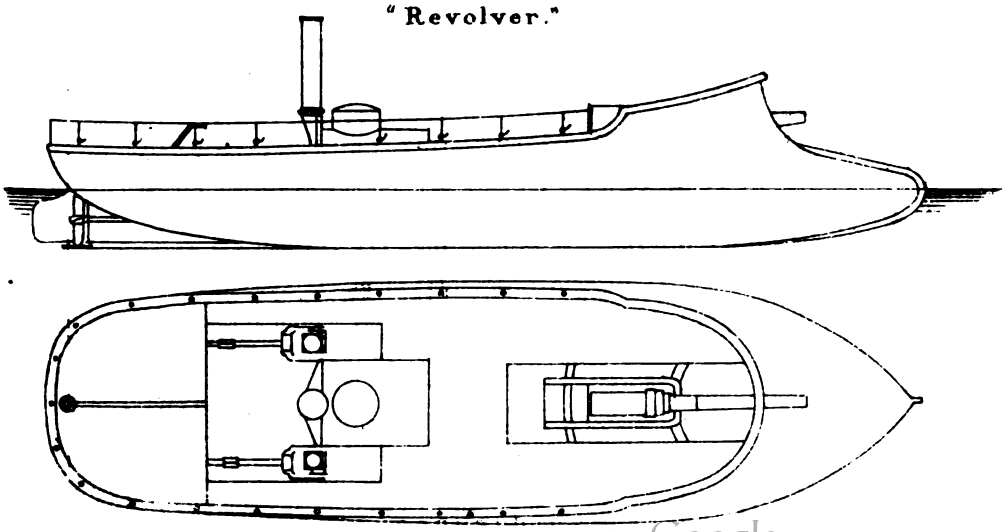
all On Special Scale.



"Henry Riviere."



"Revolver."



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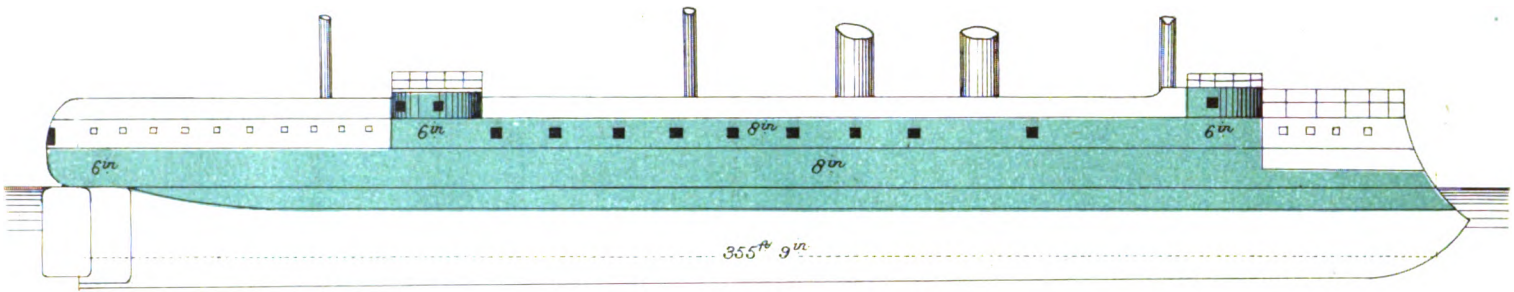
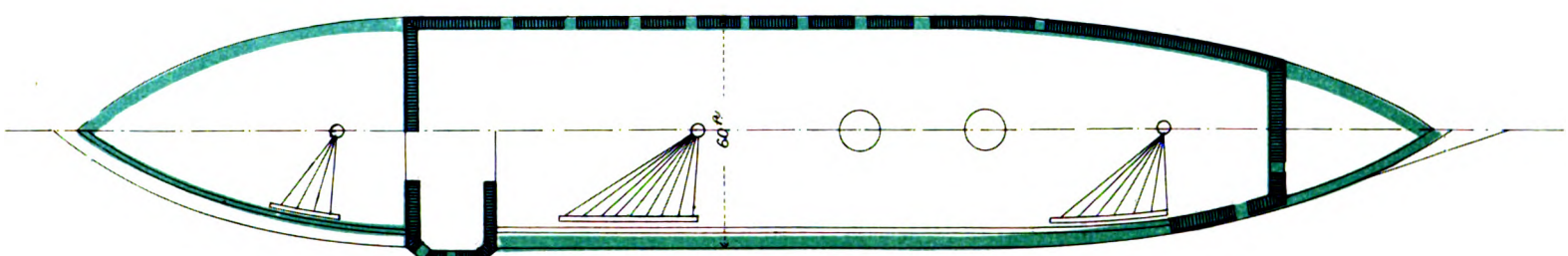
GERMAN SHIPS.

"König Wilhelm."





HANHART, LITH

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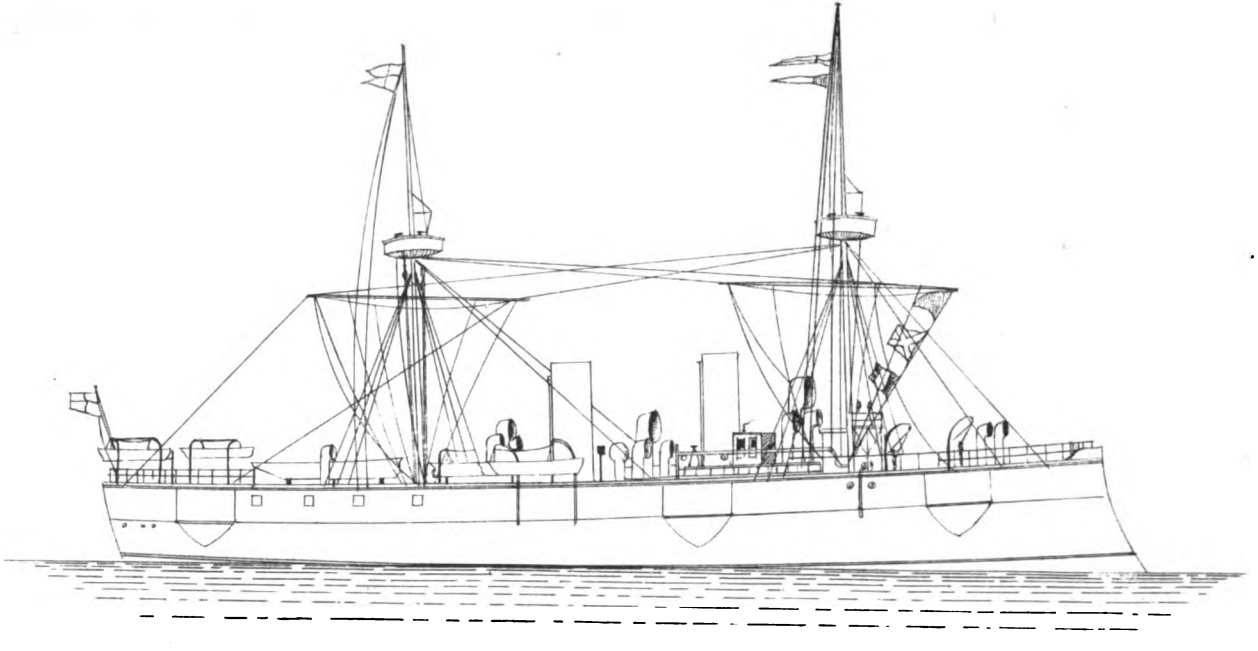
"Irene".

On Special Scale.



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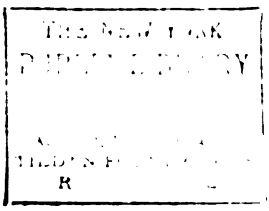
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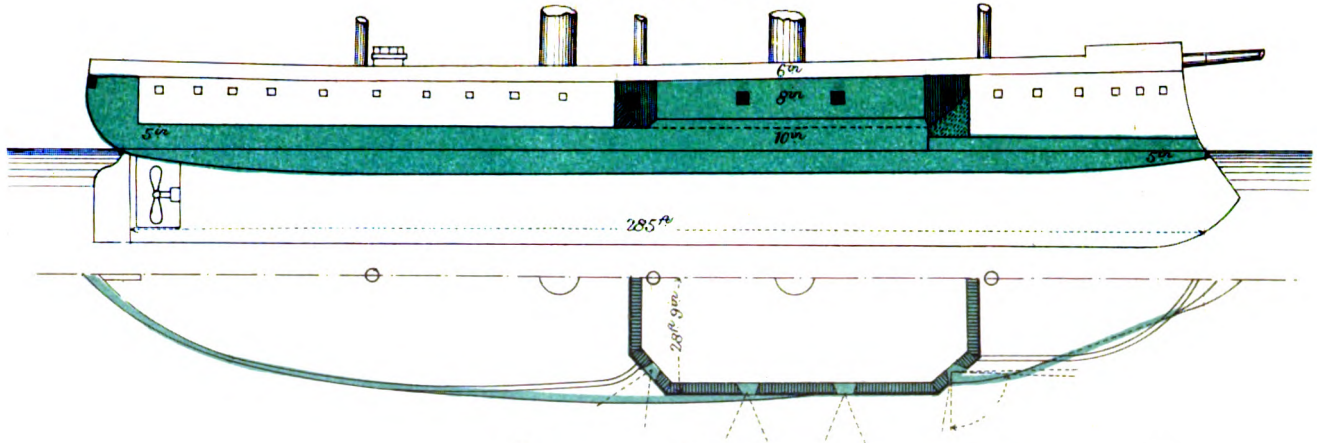
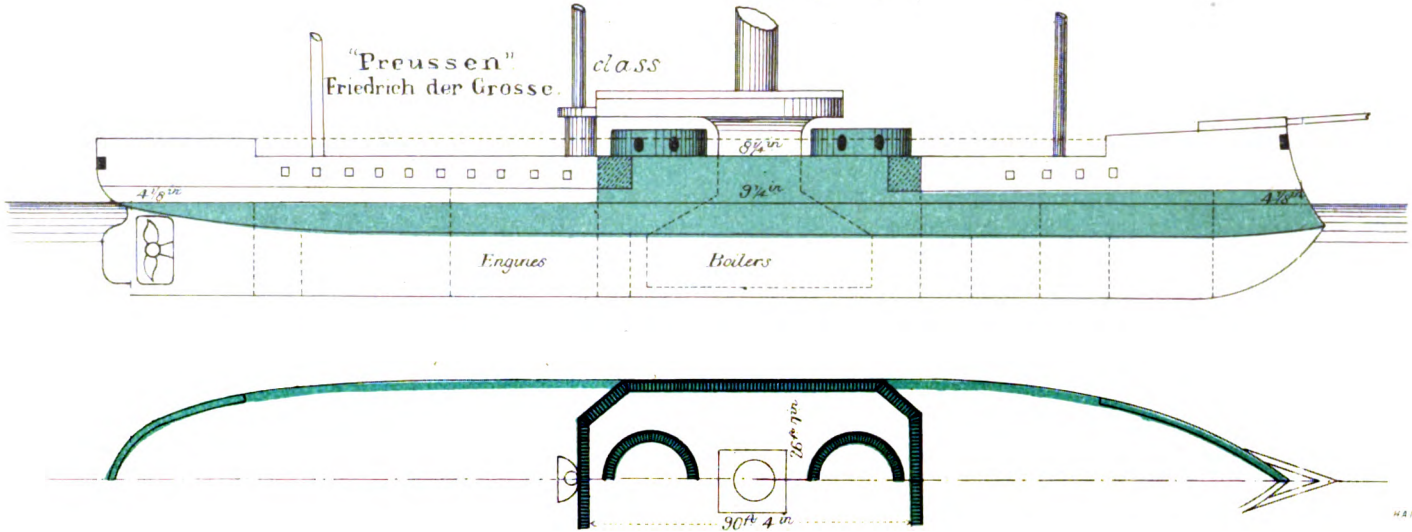
"Kaiser"
"Deutschland"



"Preussen"
Friedrich der Grosse. class



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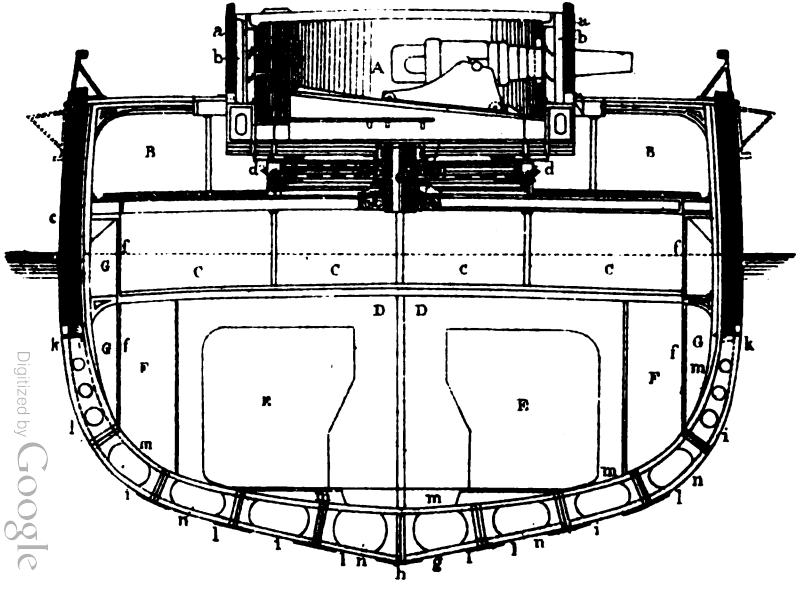
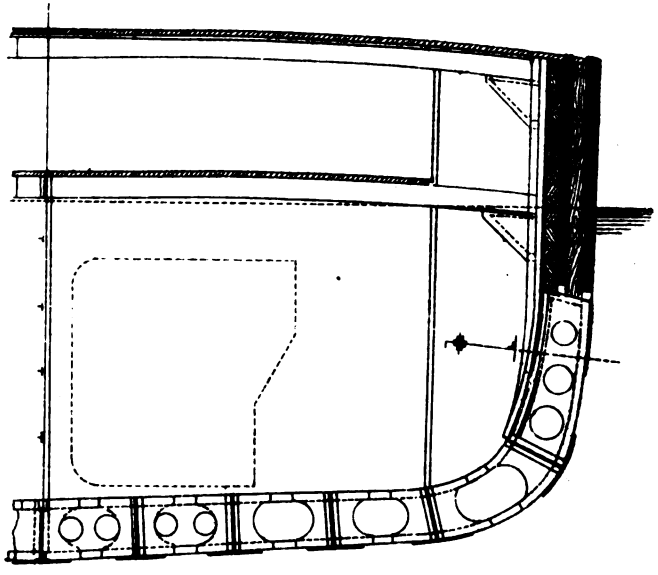
GERMAN SHIPS.

Section through turret.



Half Midship Section "Sachsen"



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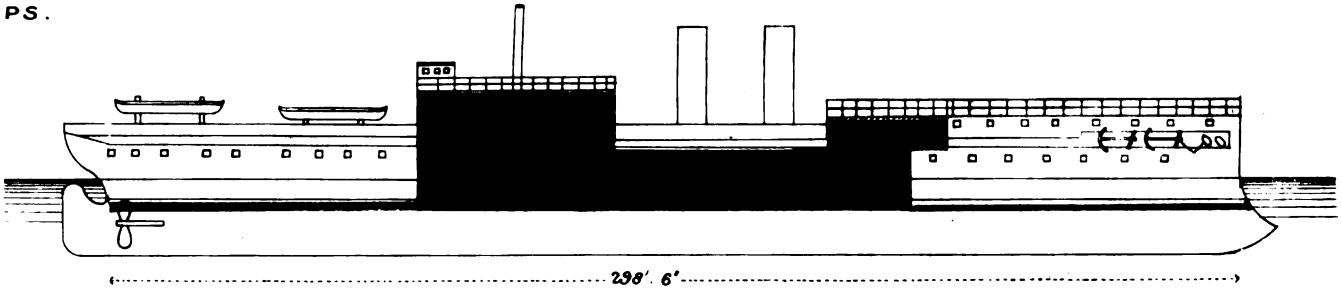
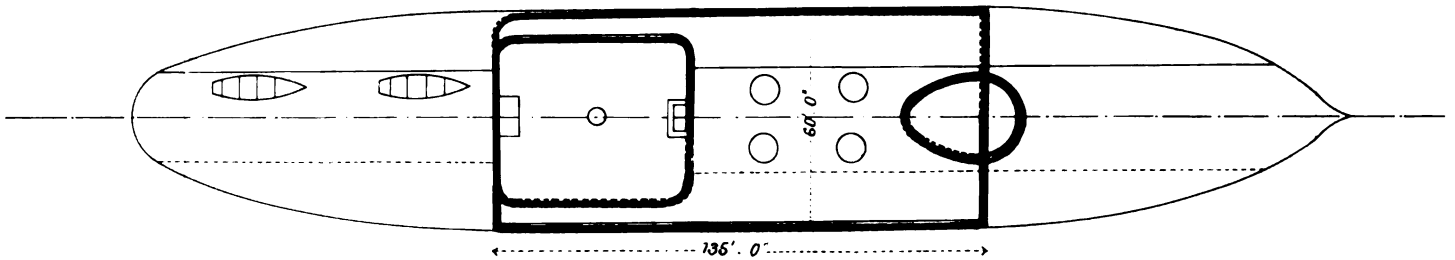
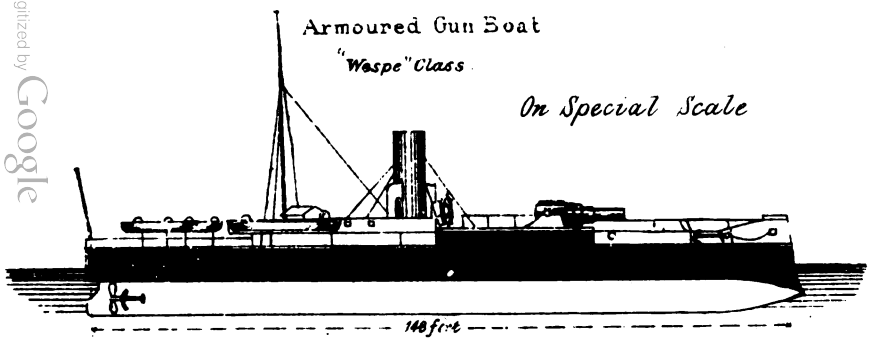


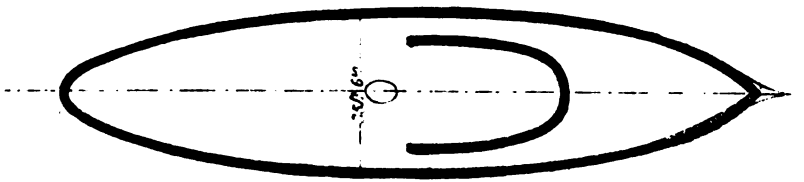


Armoured Gun Boat

"Wespe" Class

On Special Scale





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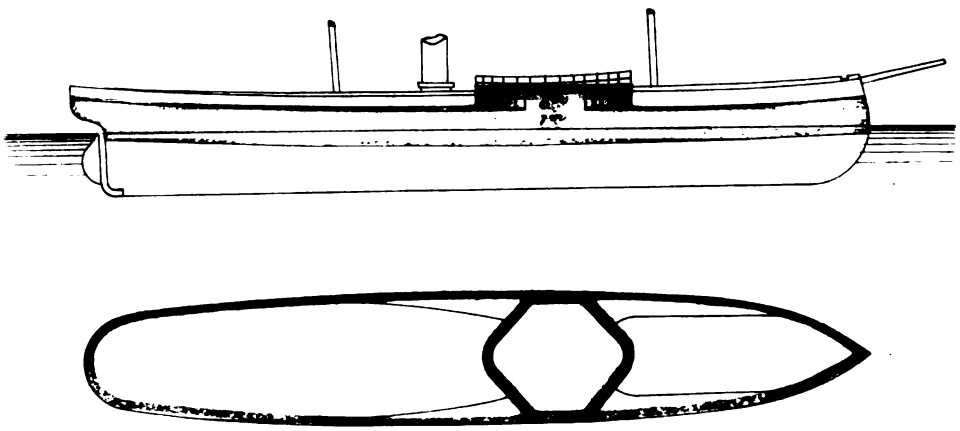
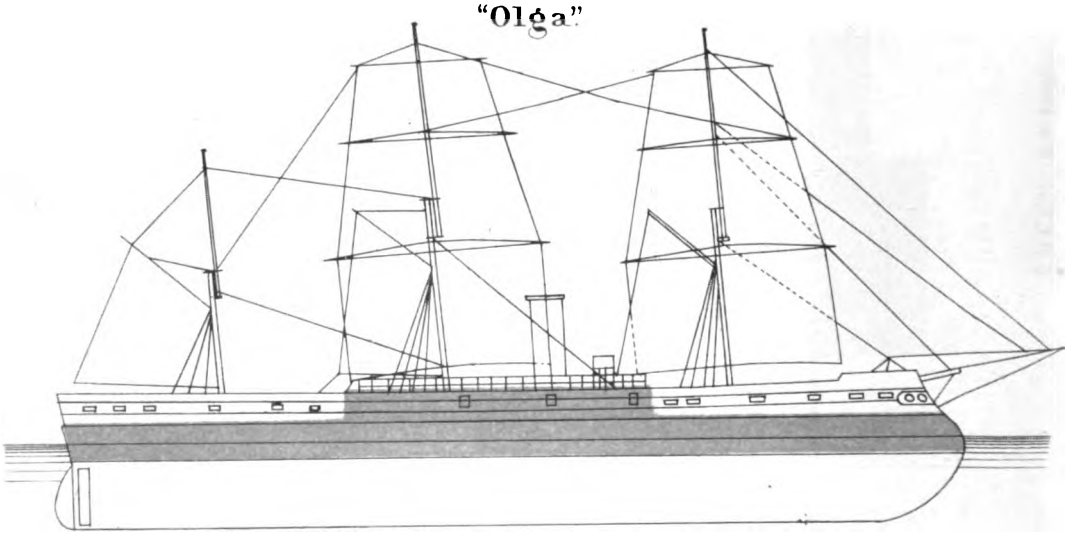
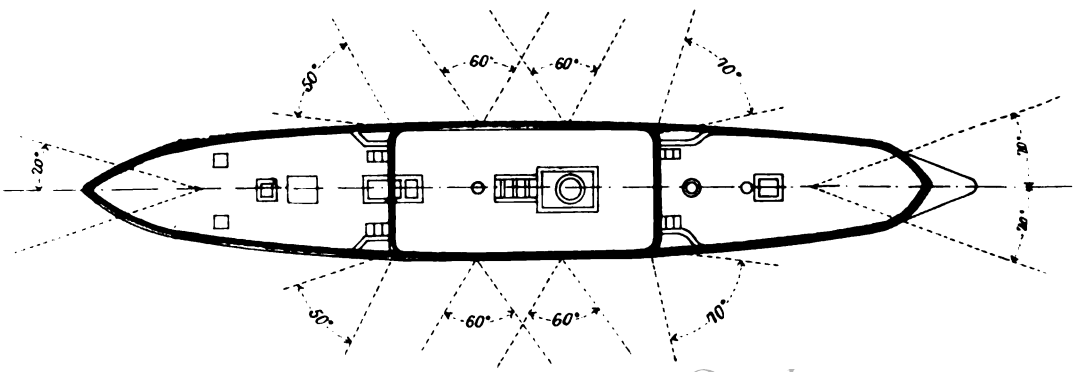
GREEK SHIPS.

"King George."



"Olga"





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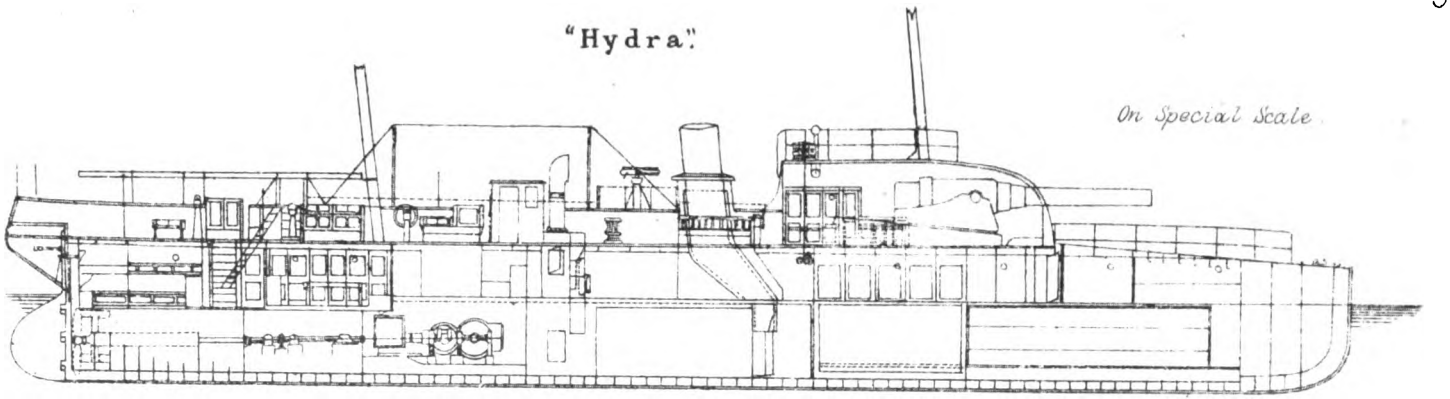
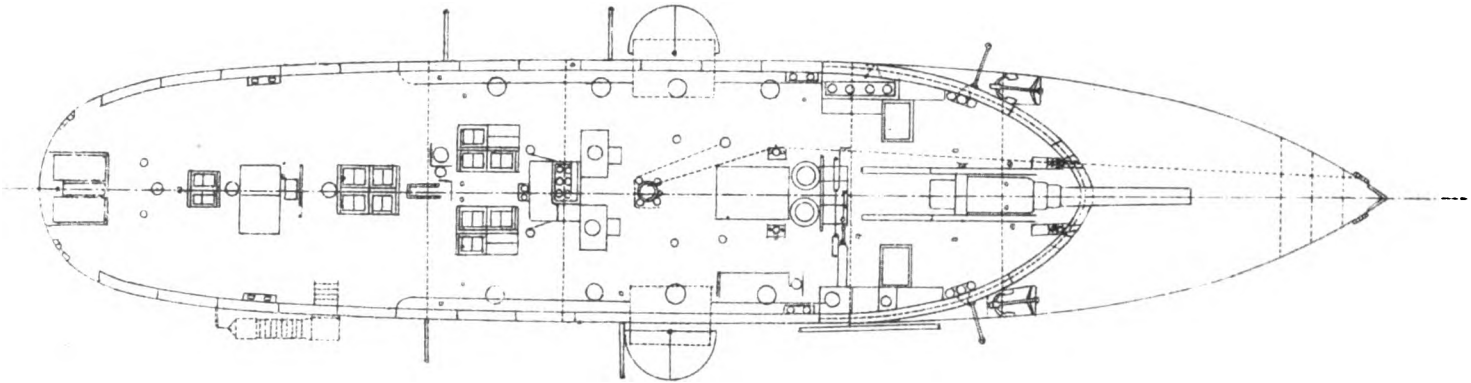
"Hydra".

On Special Scale





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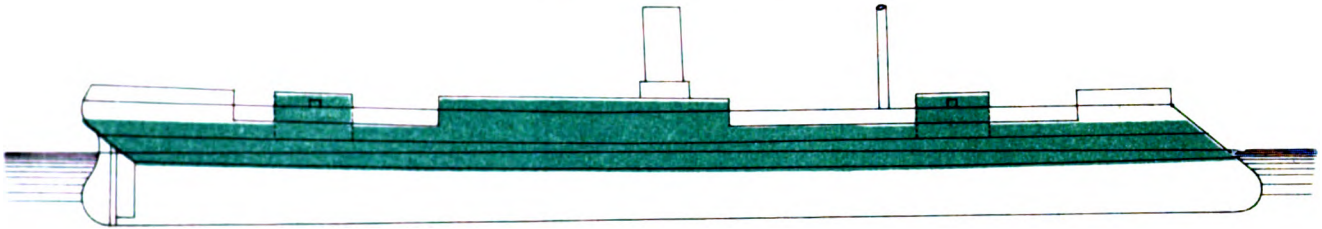
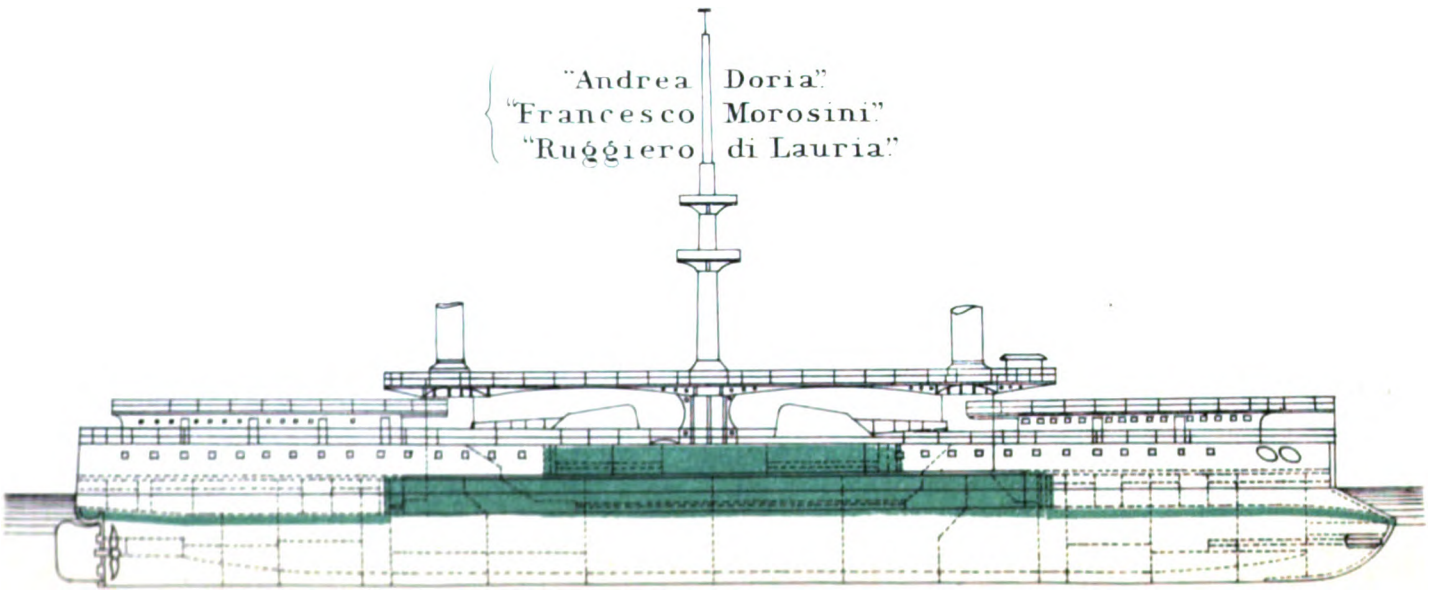
"Affondatore."



"Andrea Doria."
"Francesco Morosini."
"Ruggiero di Lauria."



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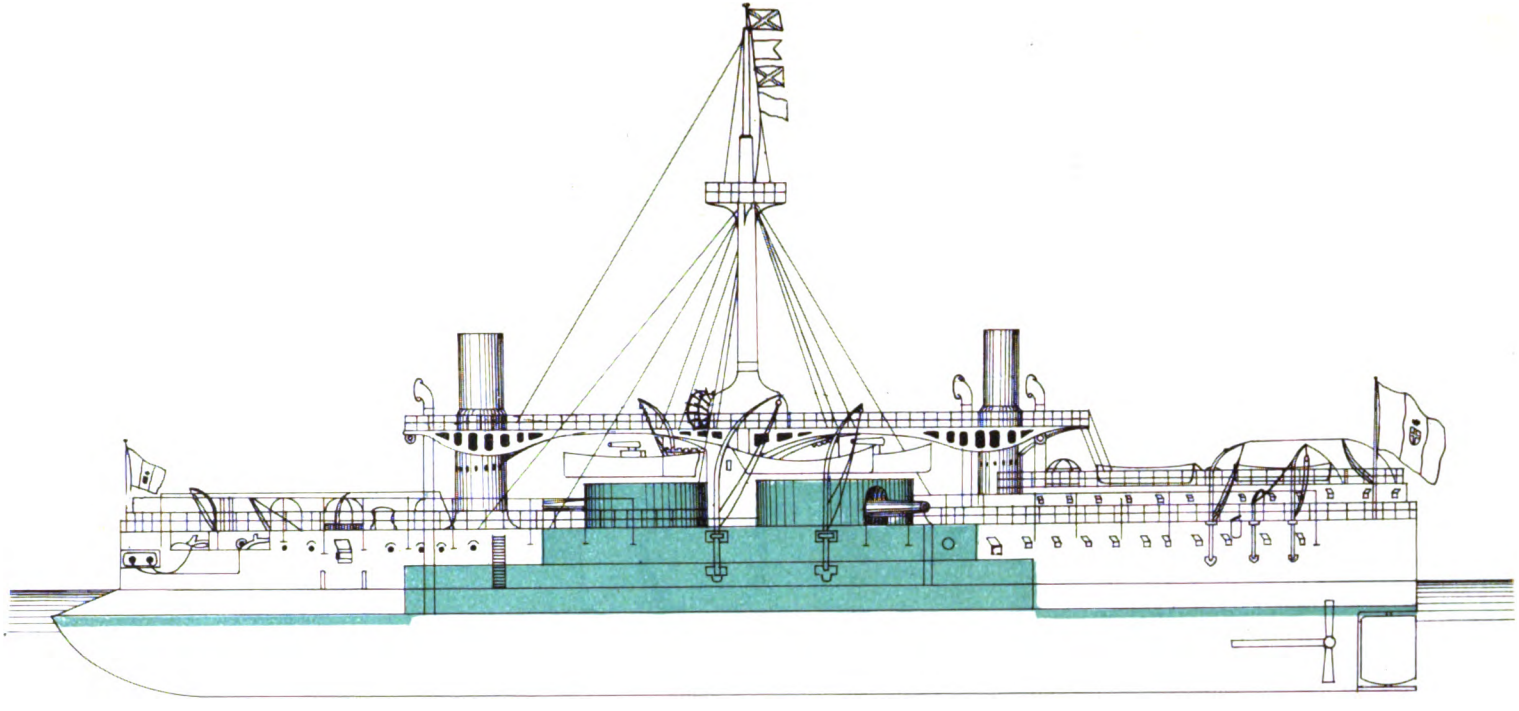
"Duilio."
"Dandolo."



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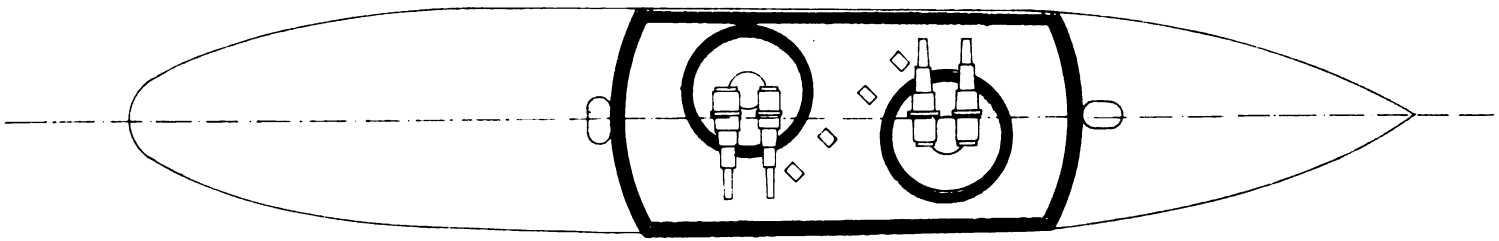
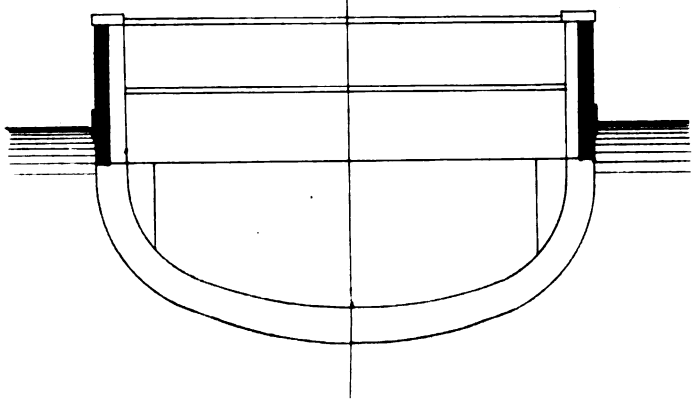
ITALIAN SHIPS.

"Duilio" & "Dandolo".

Deck Plan.



Midship Section.



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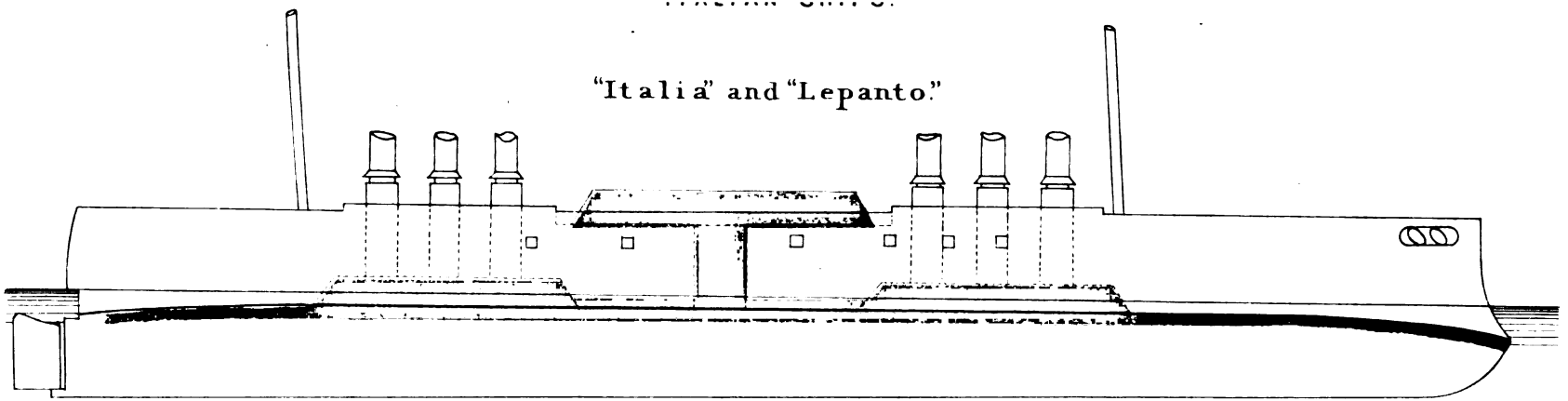
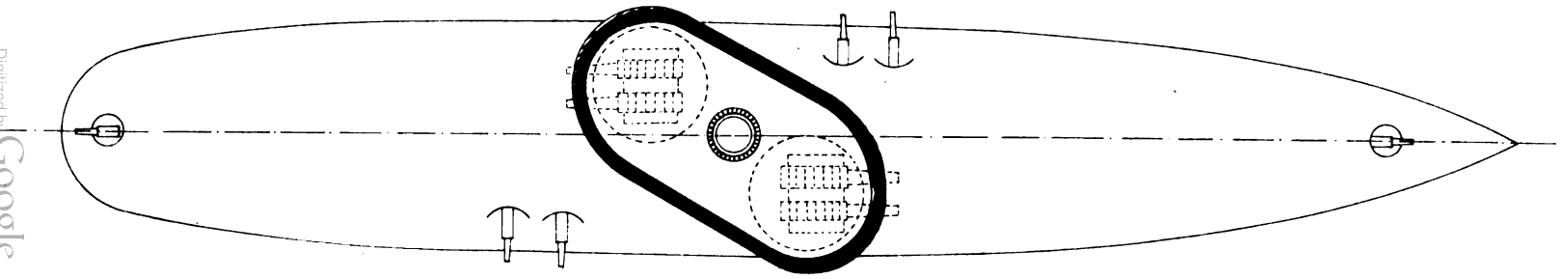
"Italia" and "Lepanto."



Upper Deck.



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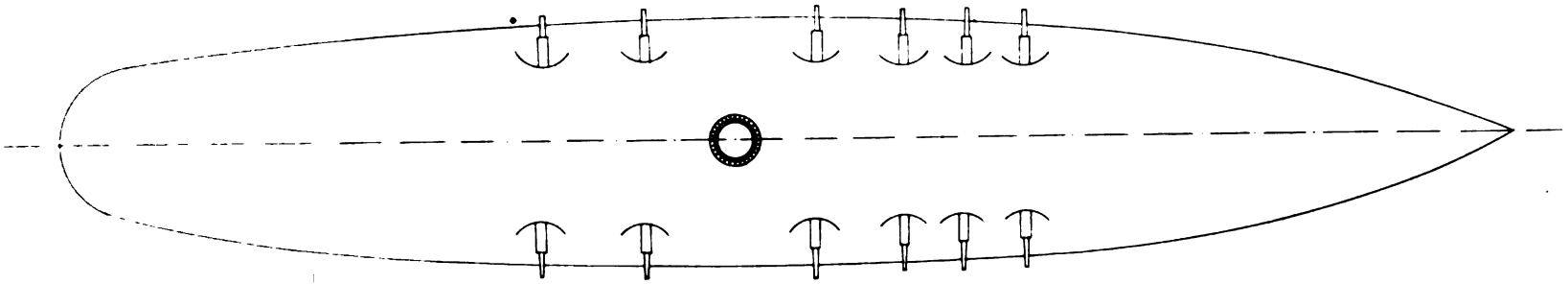
HANHART LITH.

ITALIAN SHIPS.

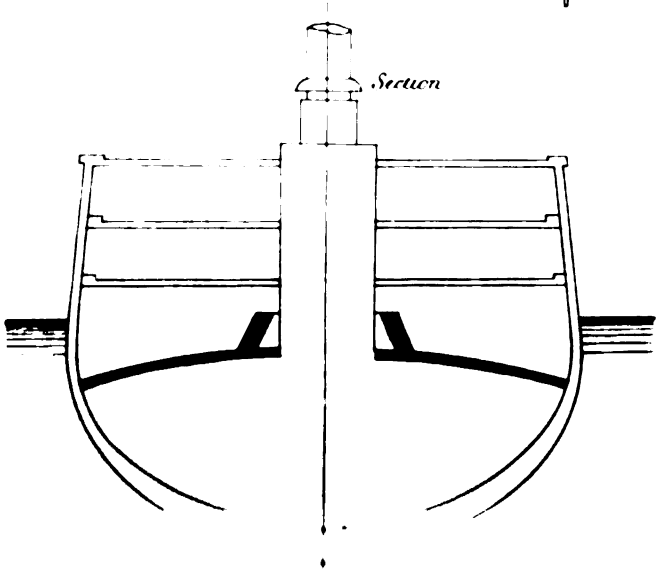
"Italia."

Main Deck.

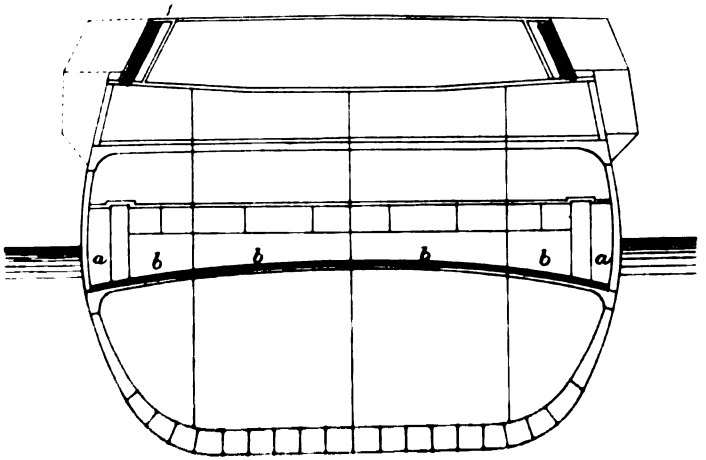
Pl 102



Section



Section



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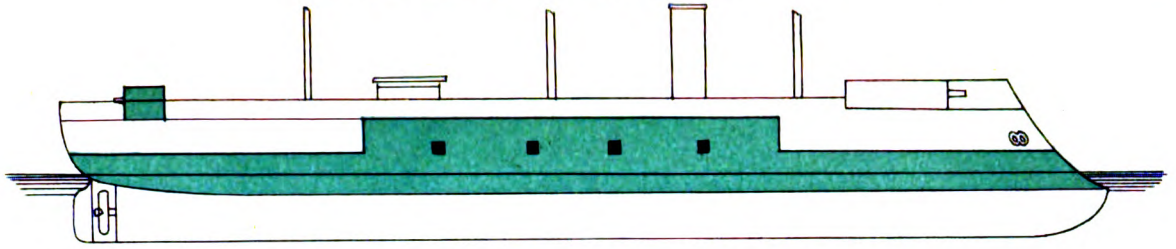
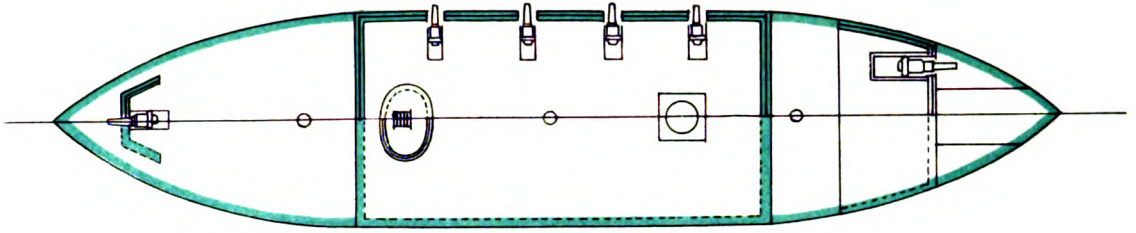
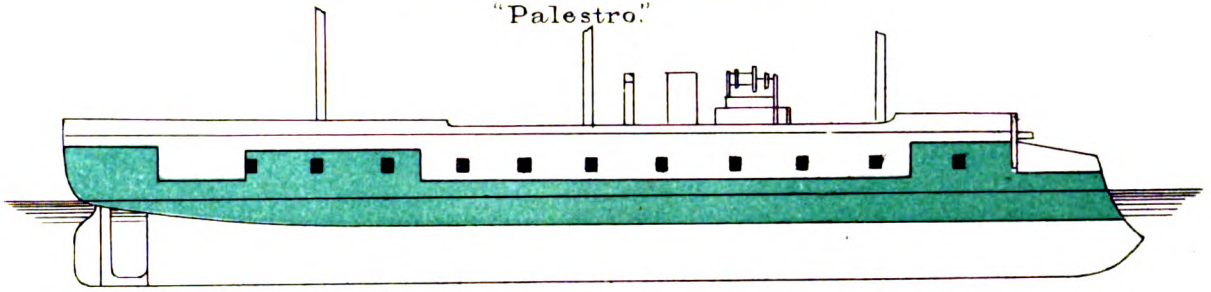
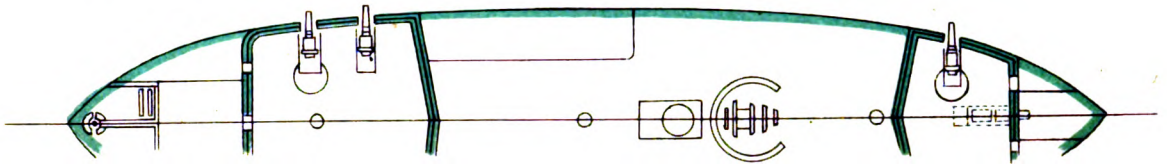




"Palestro."





HANHART LITH.

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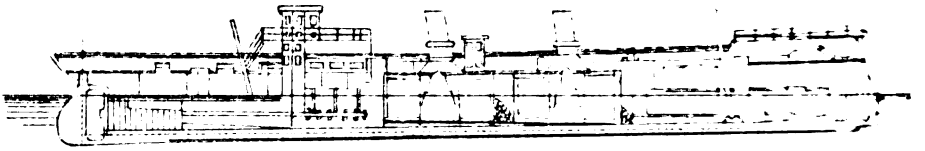
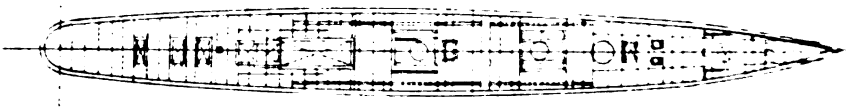
ITALIAN SHIPS

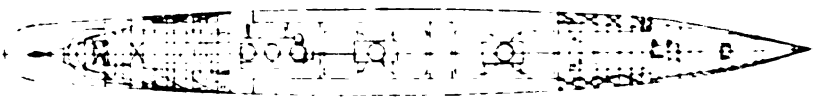
"Agostino Barbarigo"
Unarmoured Despatch Vessel.



Upper Deck



Between Decks



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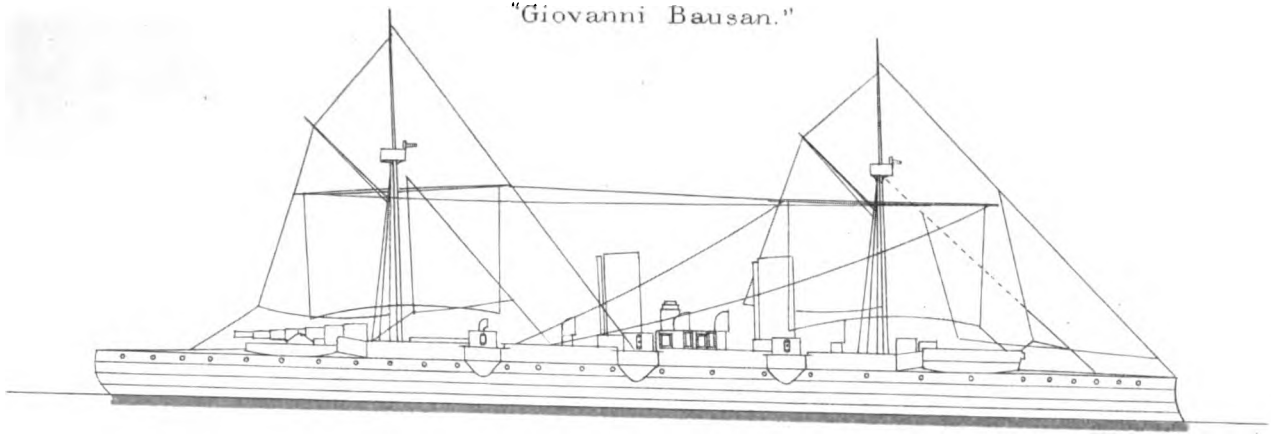
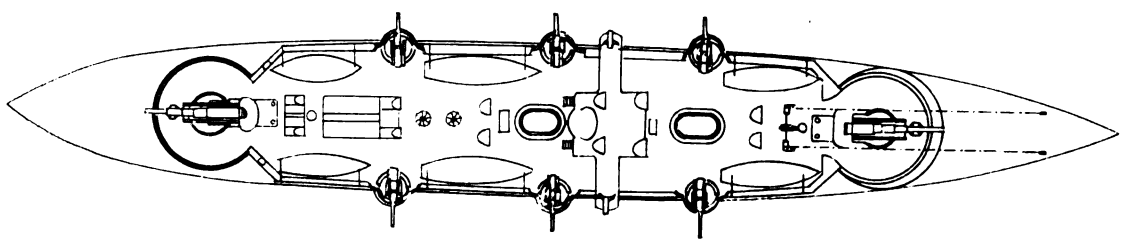
98.105.

"Giovanni Bausan."





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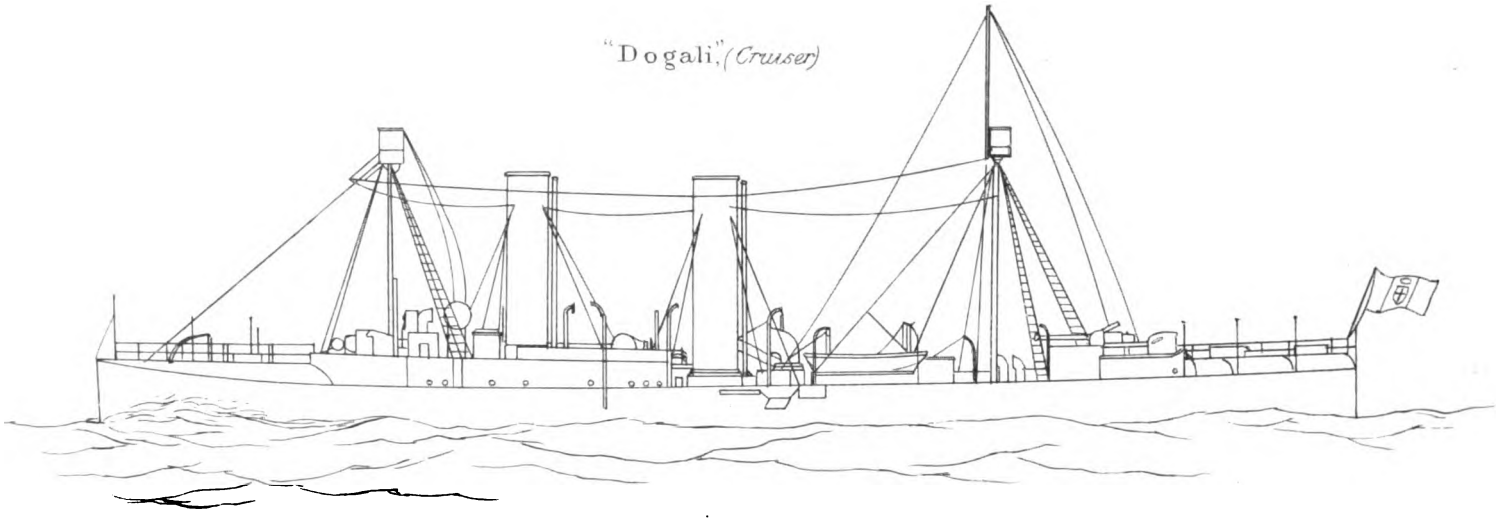
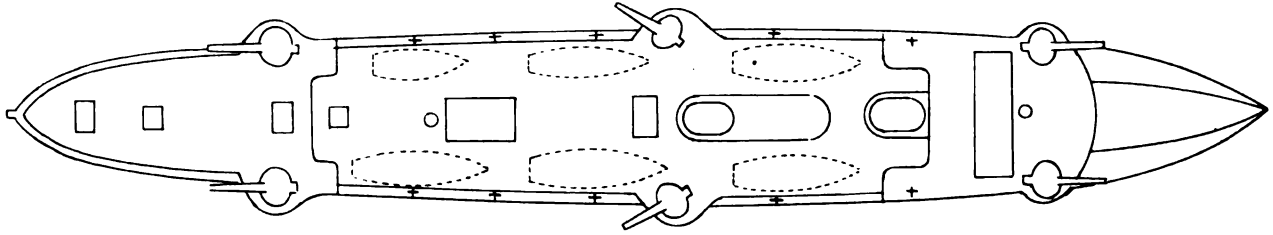
HANHART, LITH

Pl. 106.

"Dogali," (Cruiser)





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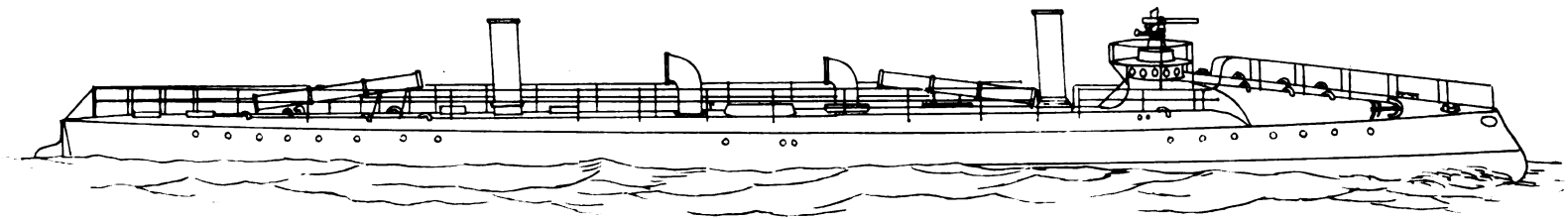
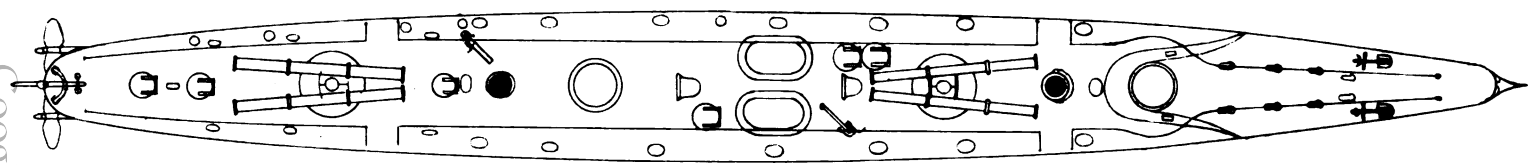
HANHART, LITH.

ITALIAN SHIPS.

On Special Scale.

Twin-Screw Torpedo Boat.





HANHART LITH

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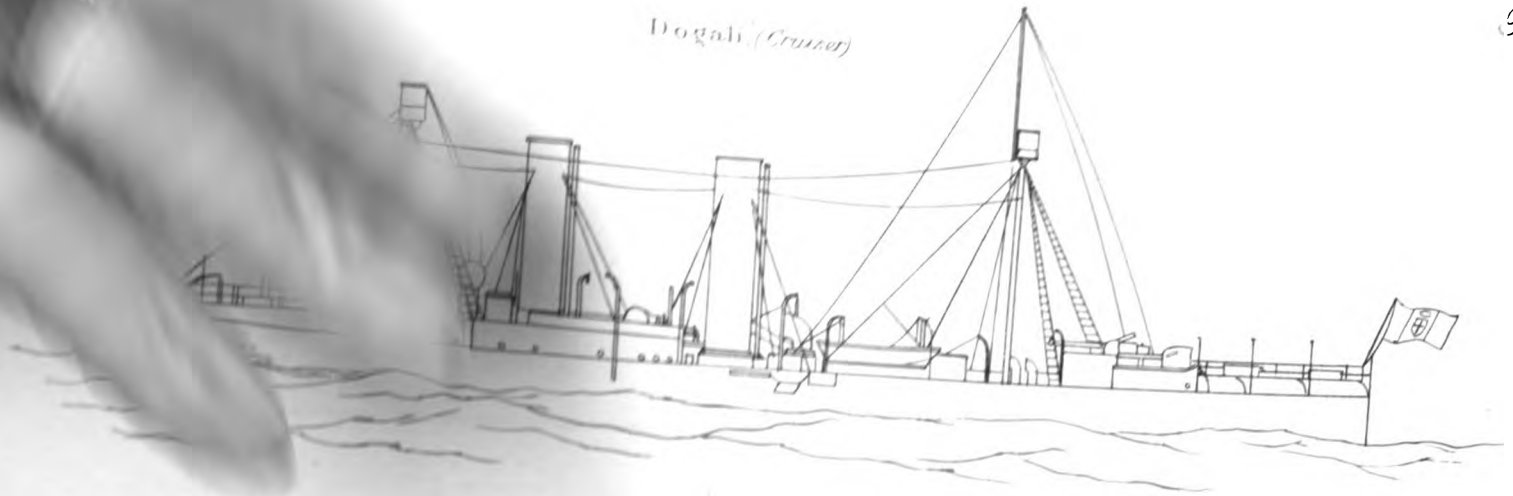
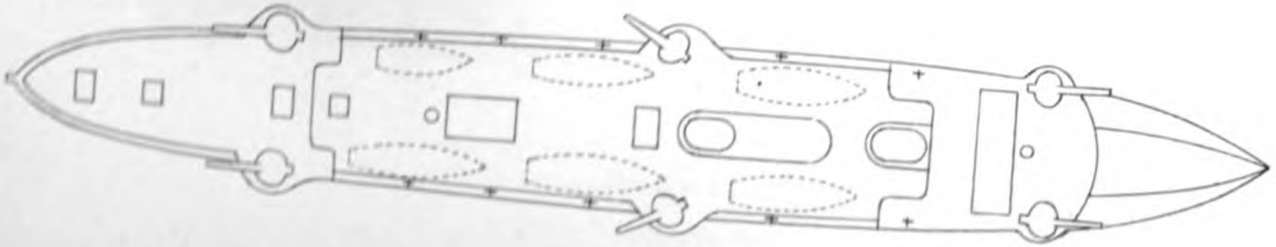
ITALIAN SHIPS.

Pl. 106.

Dogali (Cruiser)





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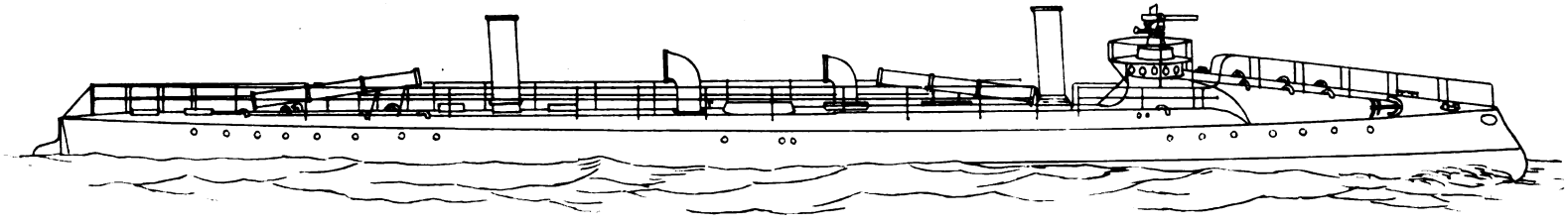
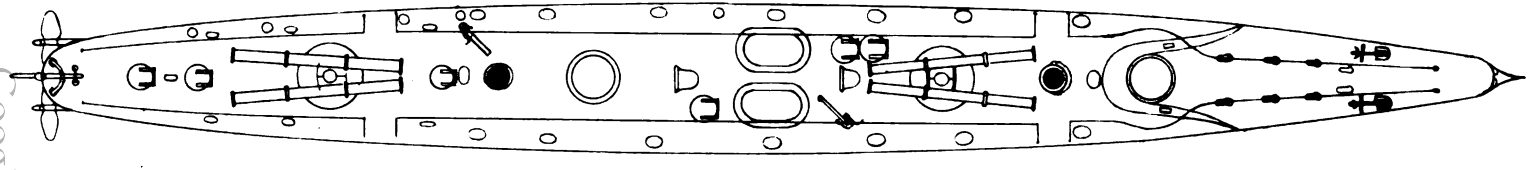
ITALIAN SHIPS.

On Special Scale.

Twin-Screw Torpedo Boat.





HANHART LITH

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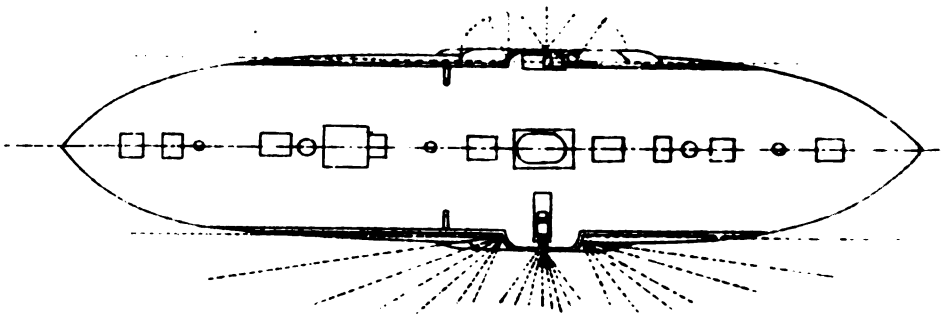
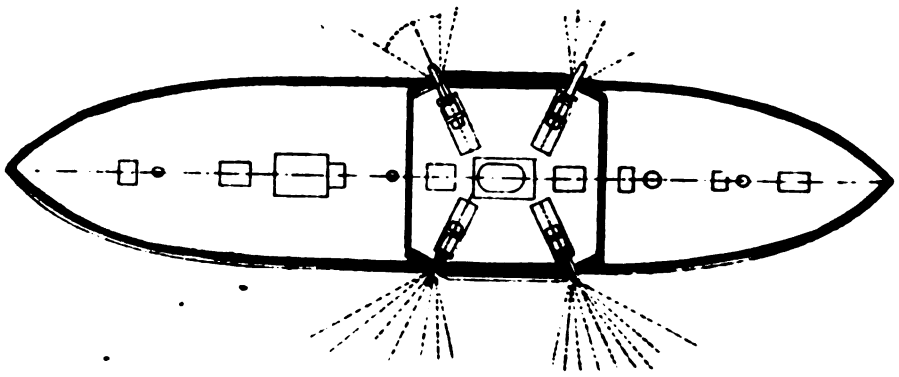
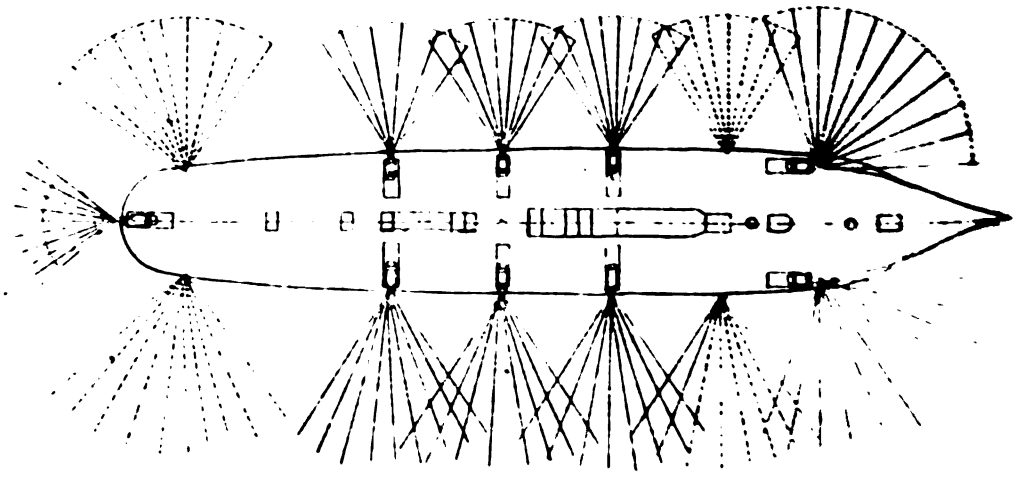
JAPANESE SHIPS.

"Fu-Soo"





"Hi-yei" & "Kin-go"



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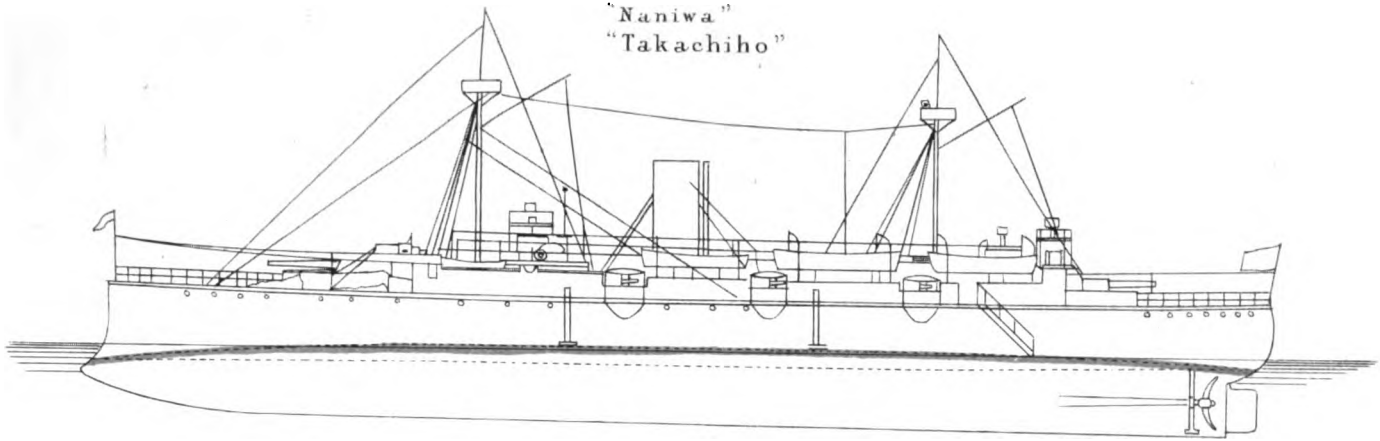
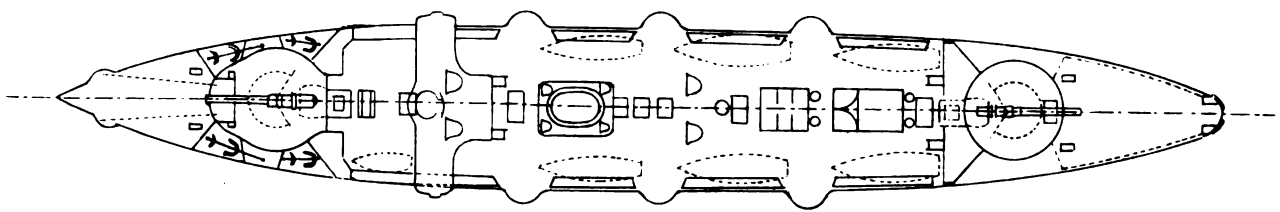
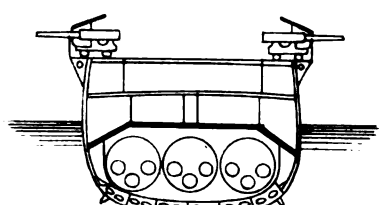
JAPANESE SHIPS.

"Naniwa"
"Takachiho"







HANHART, LITH.

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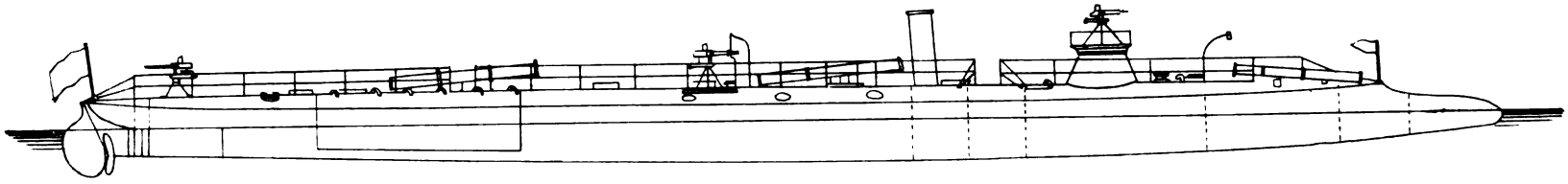
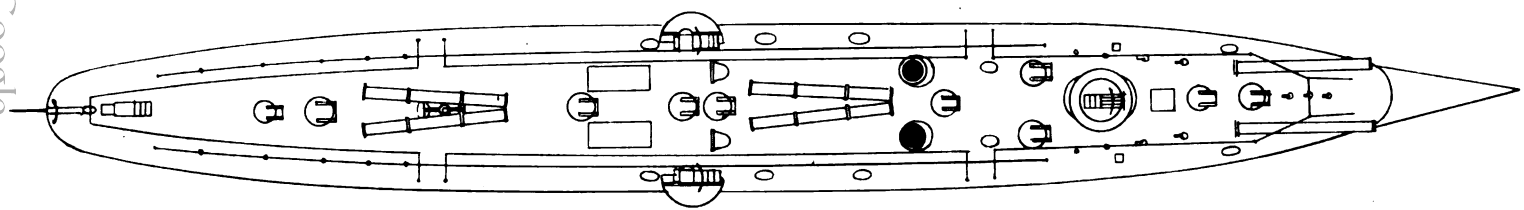
On Special Scale.

JAPANESE SHIPS.

Yarrow Torpedo Boat.





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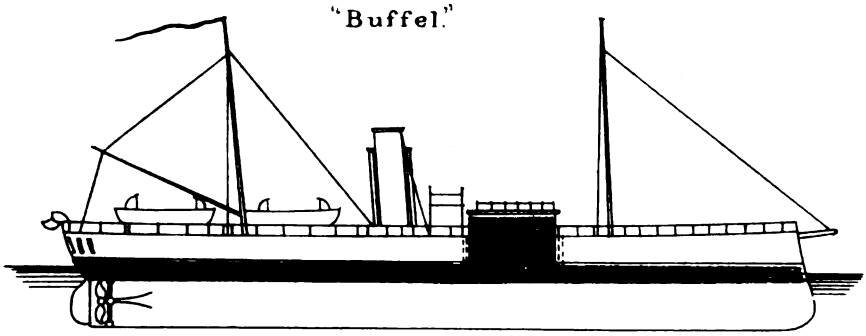
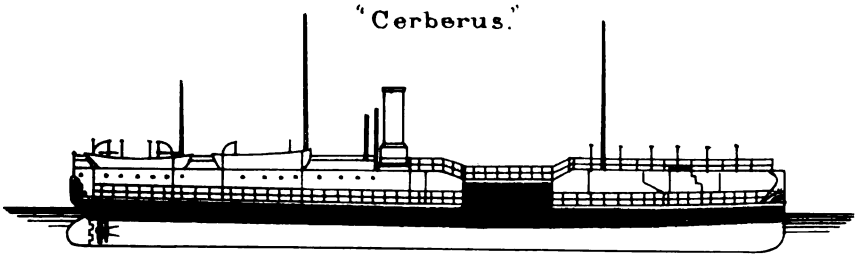
HANHART, LITH.

NETHERLANDS GOVT SHIPS.

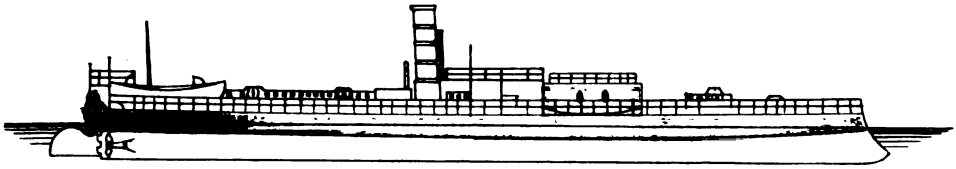
"Buffel."



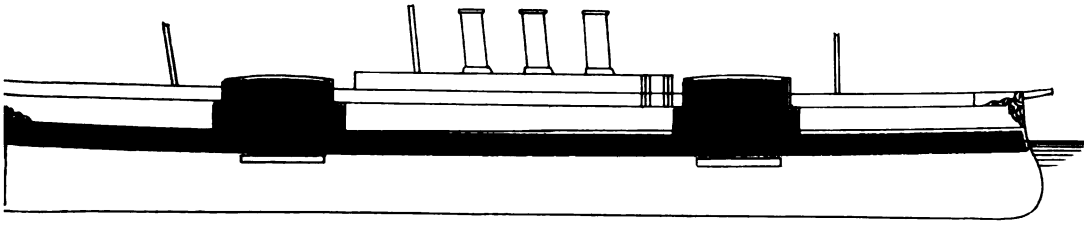
"Cerberus."

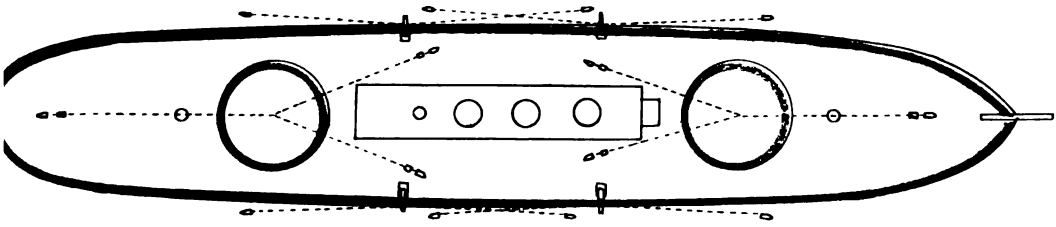


"Draak."



"Koning der Nederlander."





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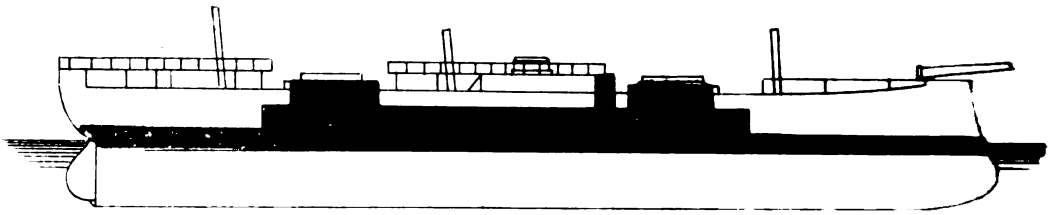
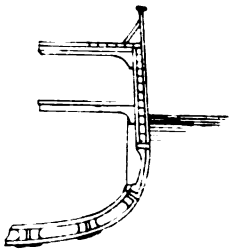
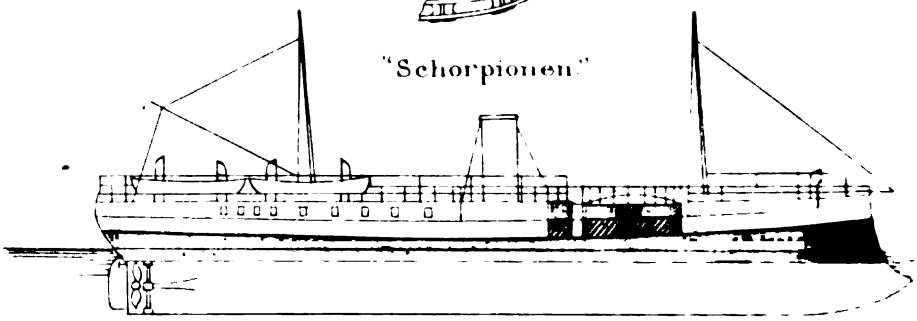
HANHART, LITH.

"Prinz Hendrik."

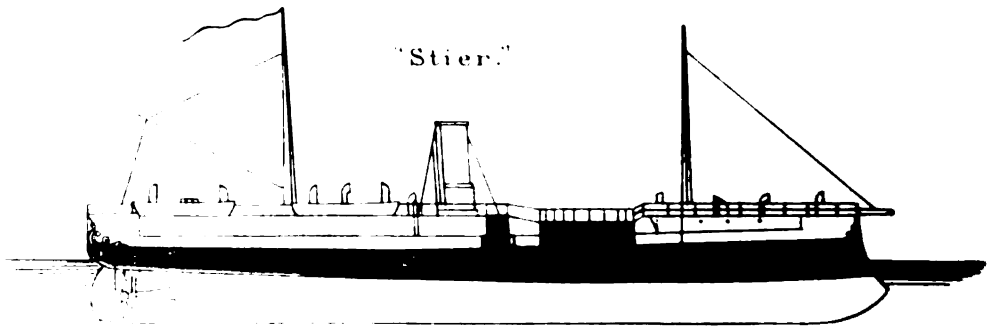




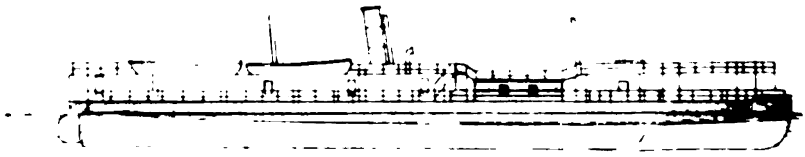
"Schorpioen."



"Stier."



"Tijger."



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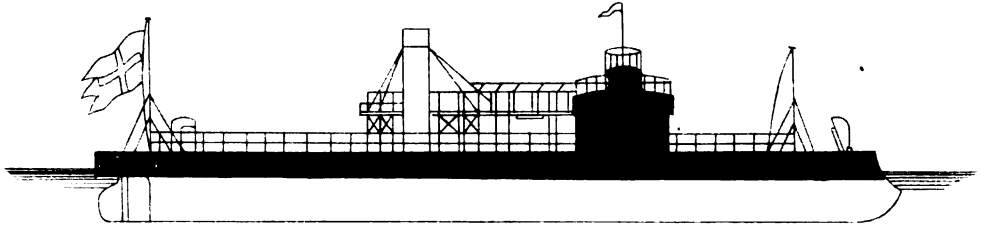
NORWEGIAN SHIPS.

"Mjolner & Thrudvang."



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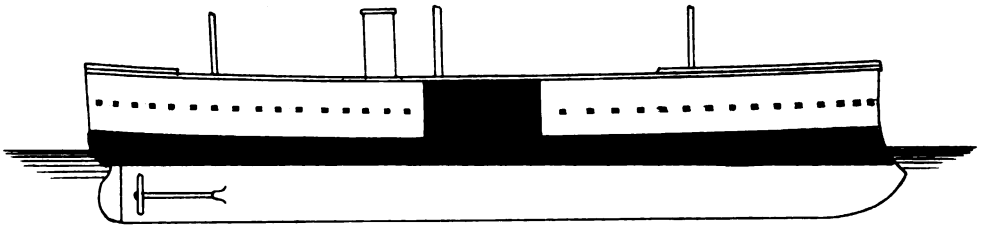
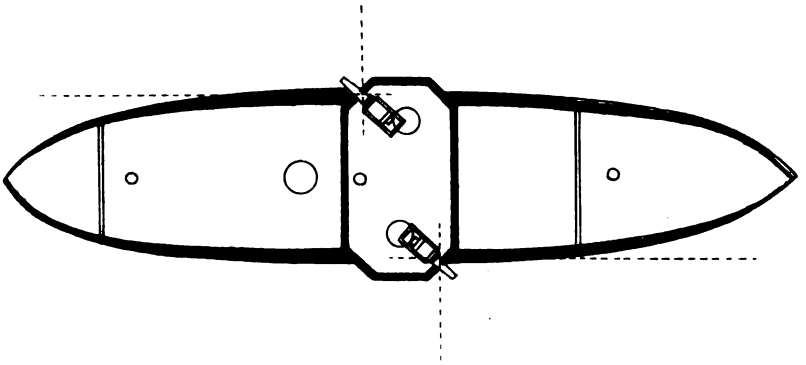
PORTUGUESE SHIPS.

"Vasco de Gama."





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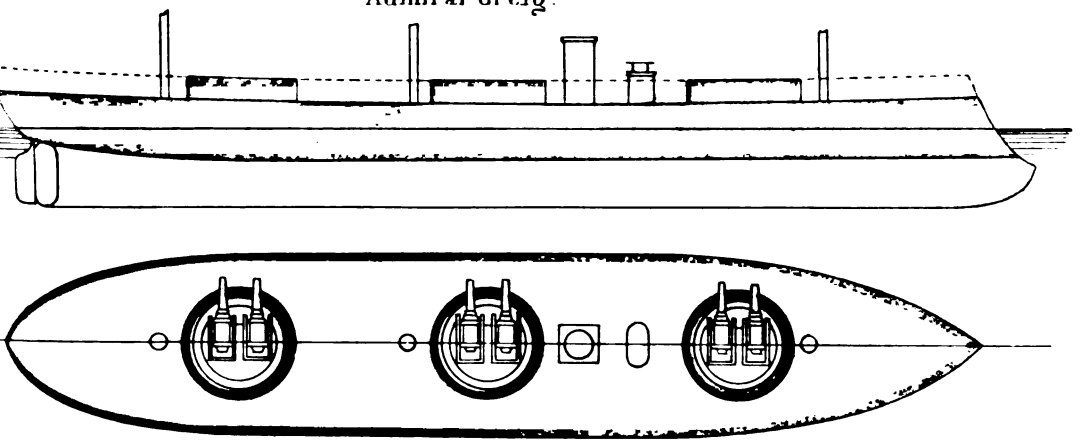
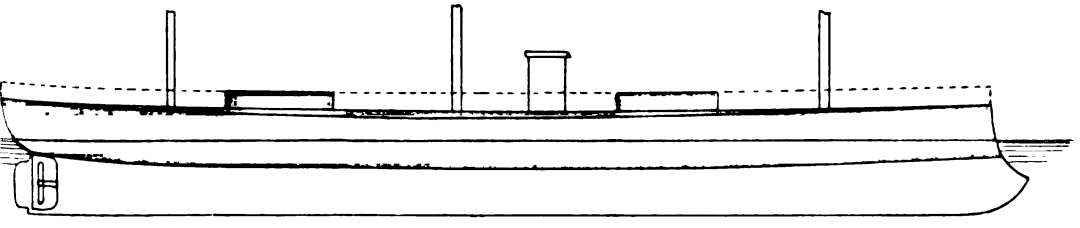
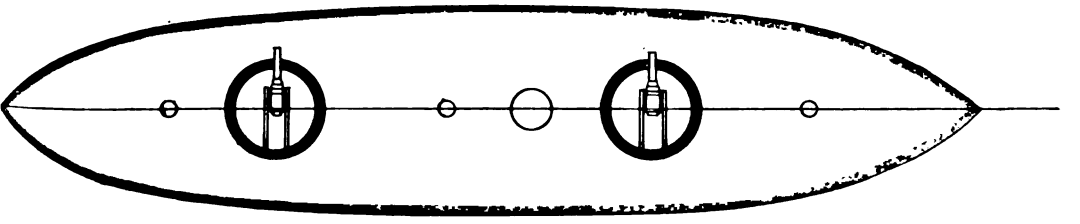
"Admiral Lazareff."
"Admiral Greig."

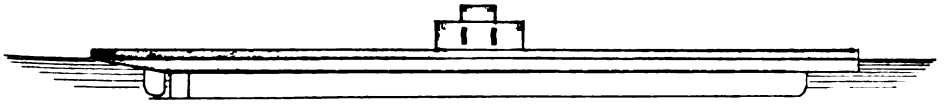


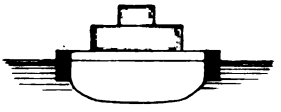
"Admiral Spiridoff."





"Bronenosetz."
"Edinoroǵ"
"Koldun"
"Latnik"
"Perun"
"Strelitz."
"Veshtchun" &c.





HANHART, LITH

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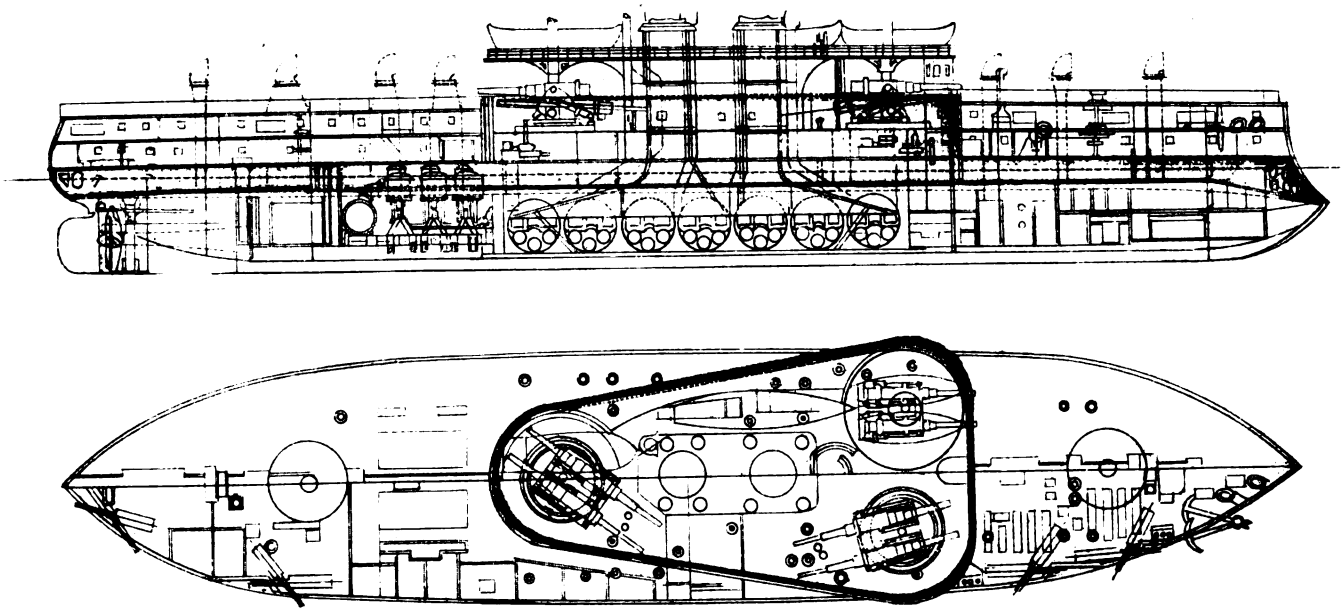
92 116.

RUSSIAN SHIPS.



"Catherine II".
"Tchsme".
"Sinope".

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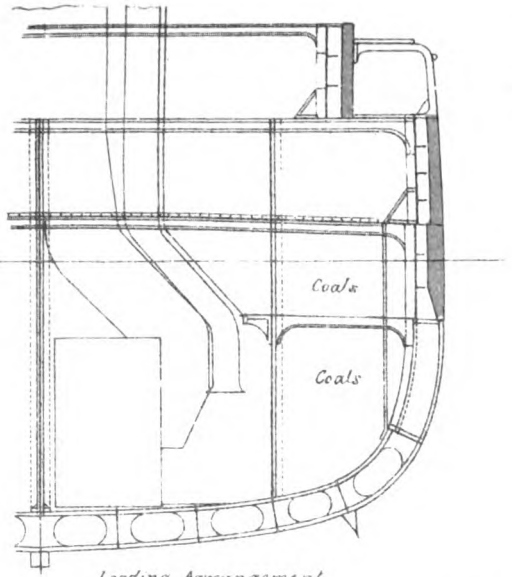
"Tchesme"
"Sinope"
"Catherine. II."

RUSSIAN SHIPS.



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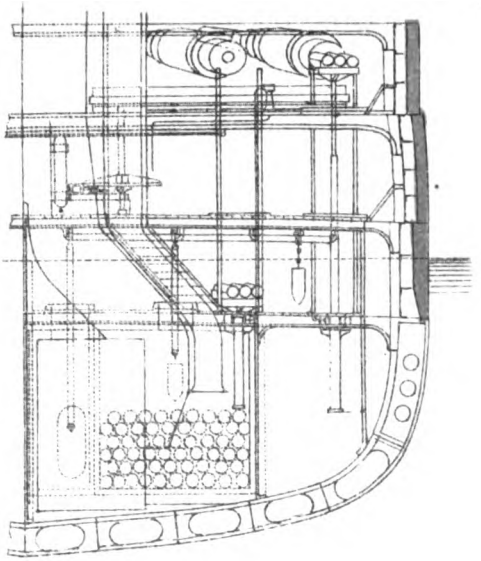
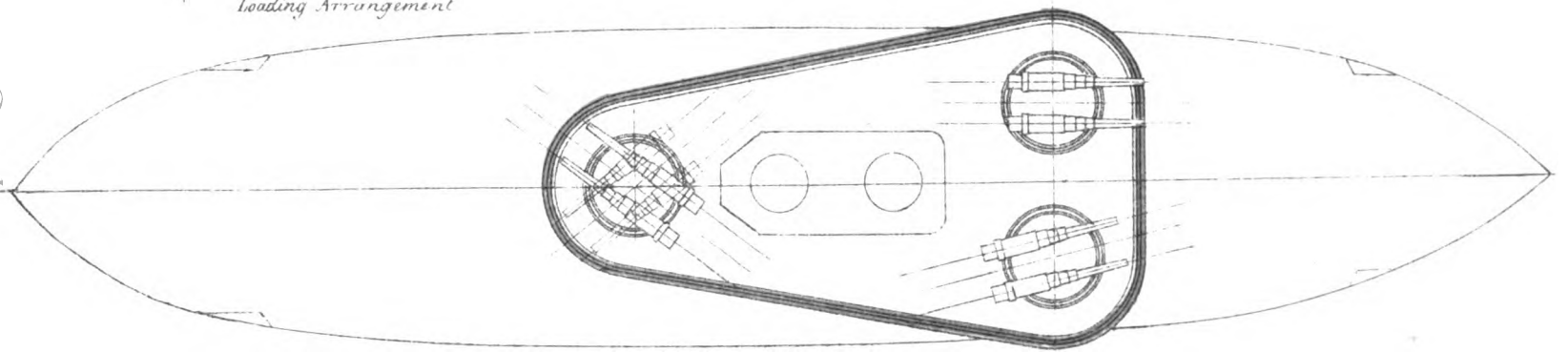


On Special Scale



"Catherine. II."

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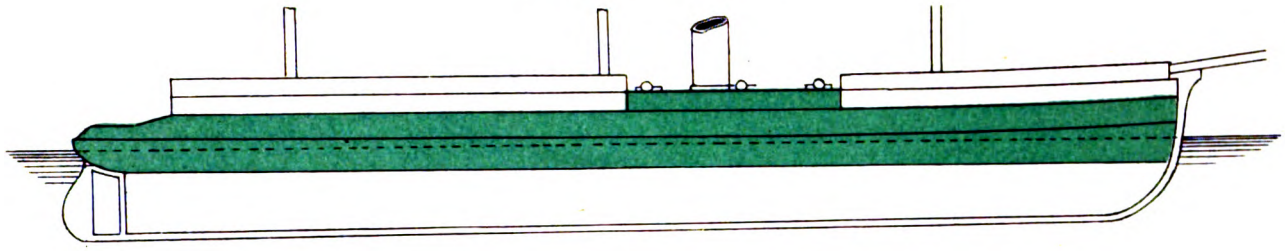
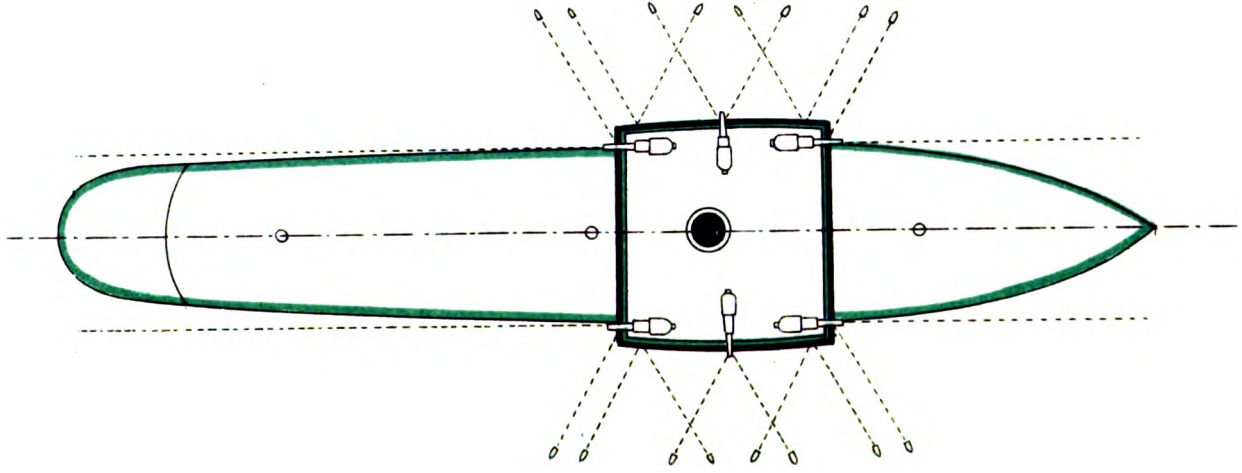
RUSSIAN SHIPS.

"General-Admiral."
"Herzog Edinburgski."





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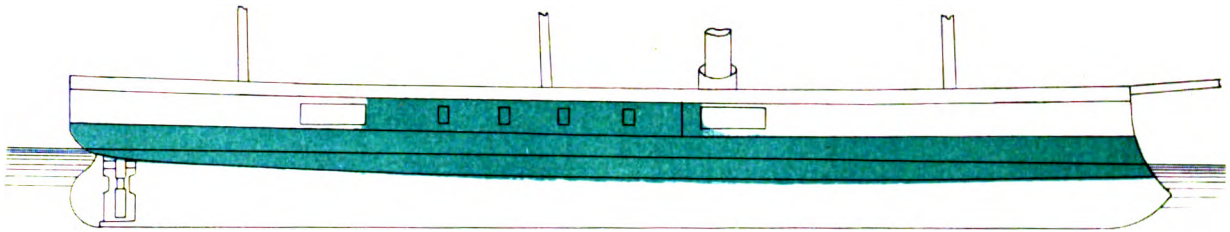
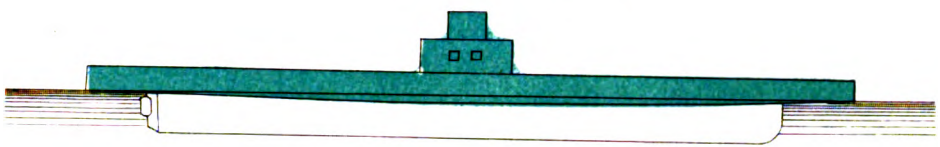
"Kniaz Pojarski"



"Lava, Tifun, Uragan" &c



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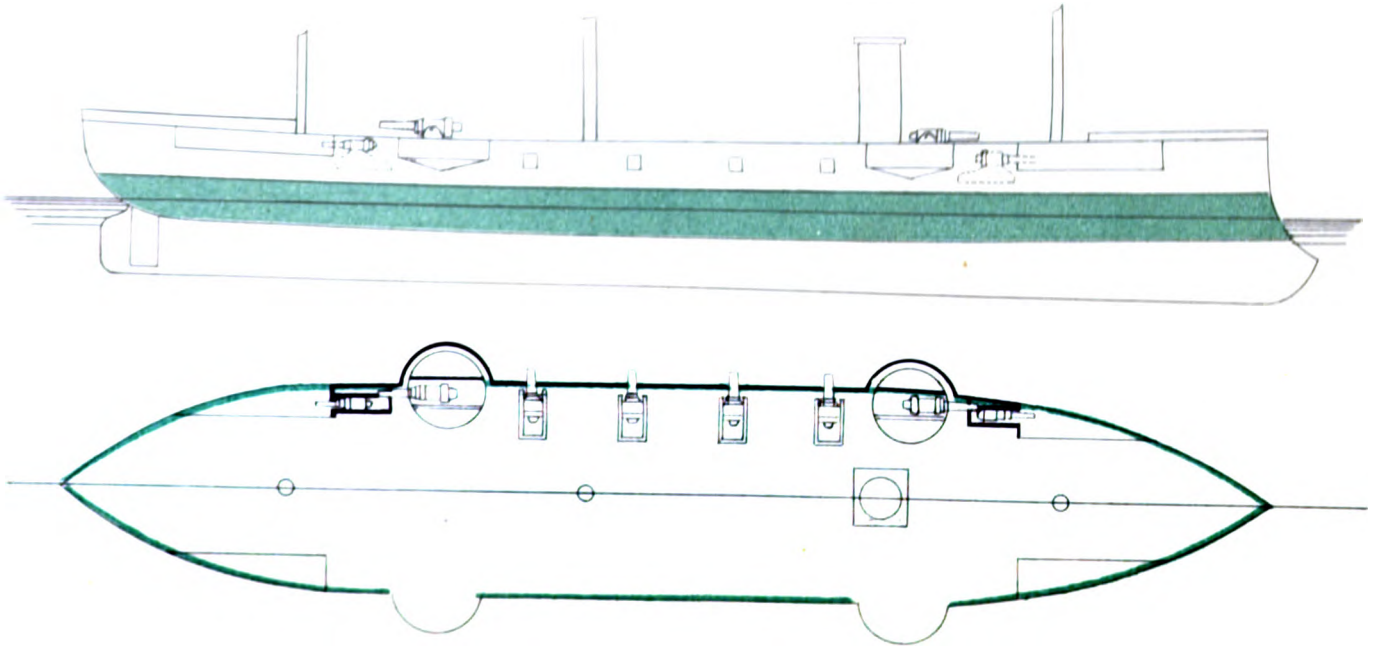
RUSSIAN SHIPS

"Minin"



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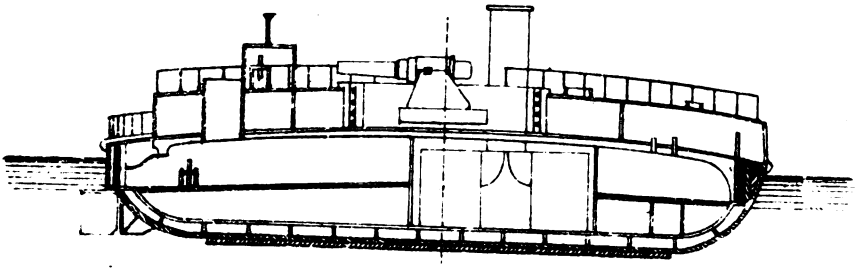
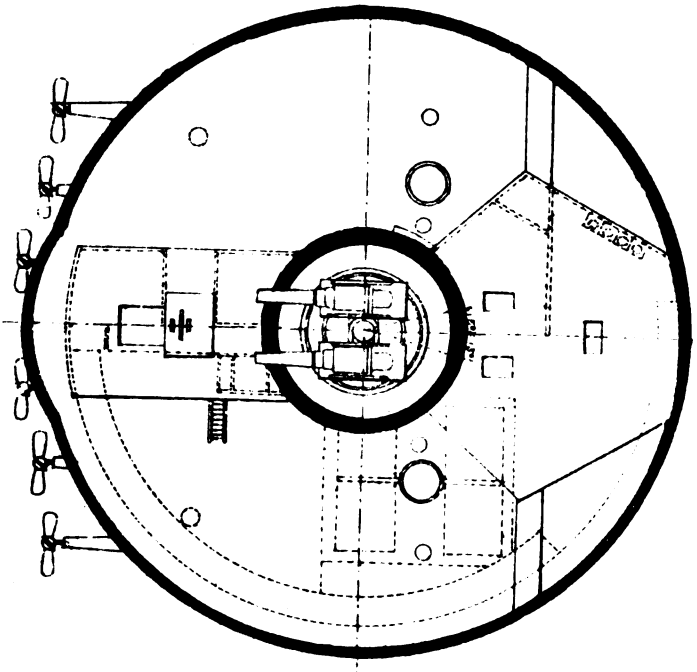
"Novgorod", *Section.*



Plan.



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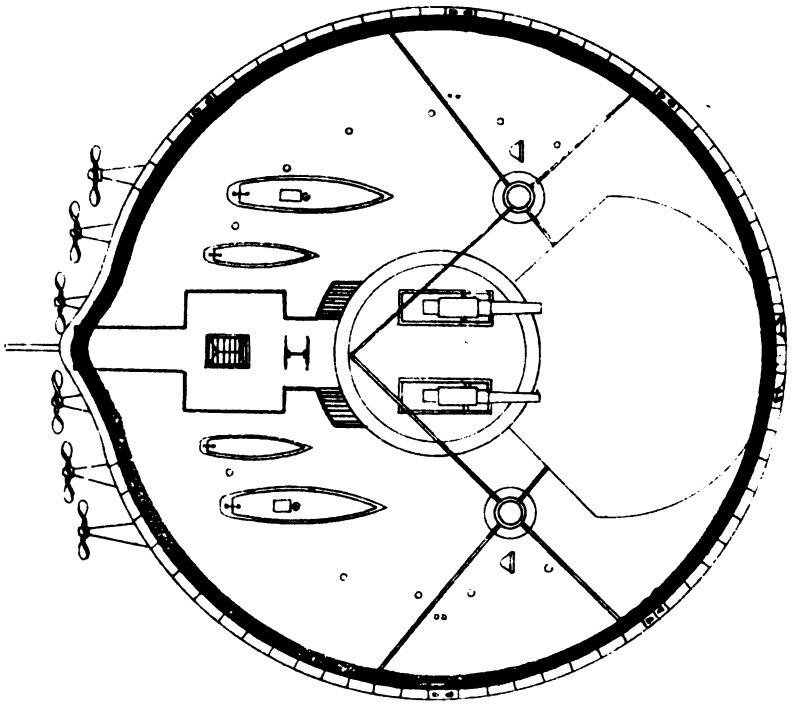
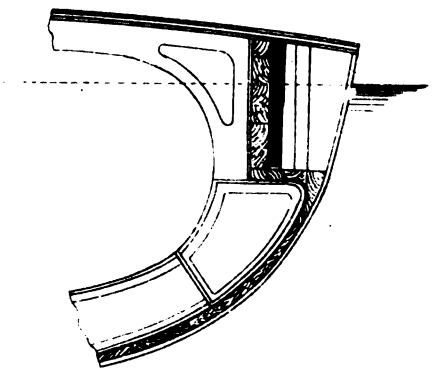
RUSSIAN SHIPS.

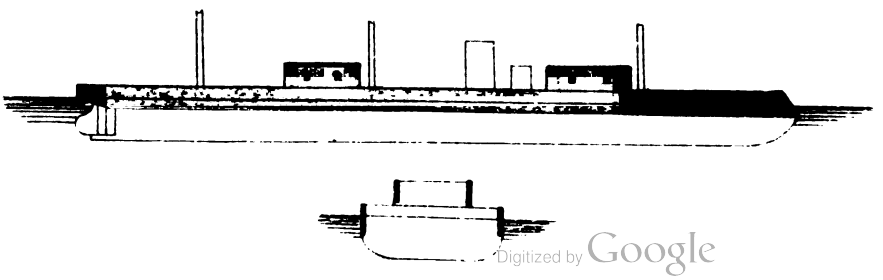
Deck of "Novgorod."



Side Armour of the "Vice Admiral Popoff."



"Smertz"



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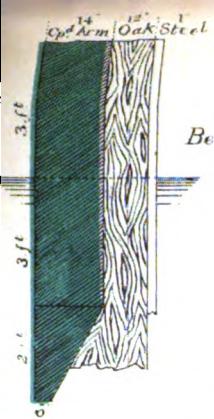
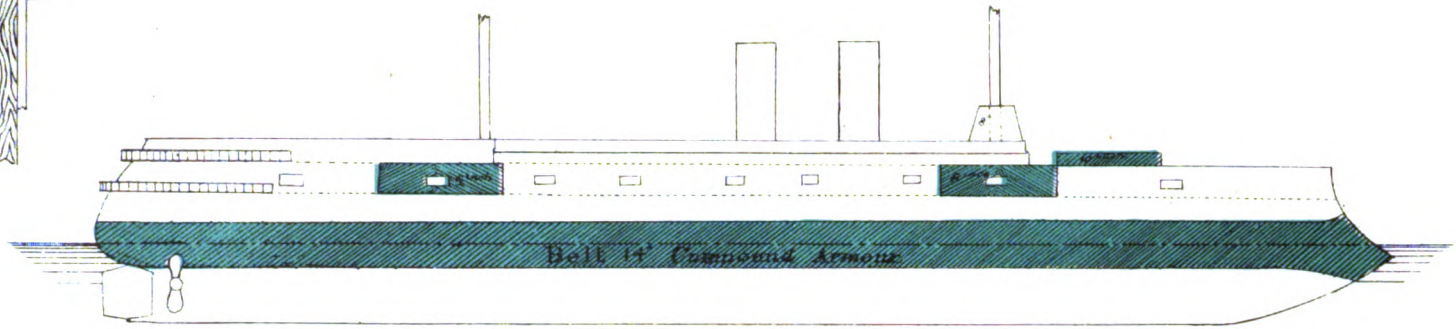
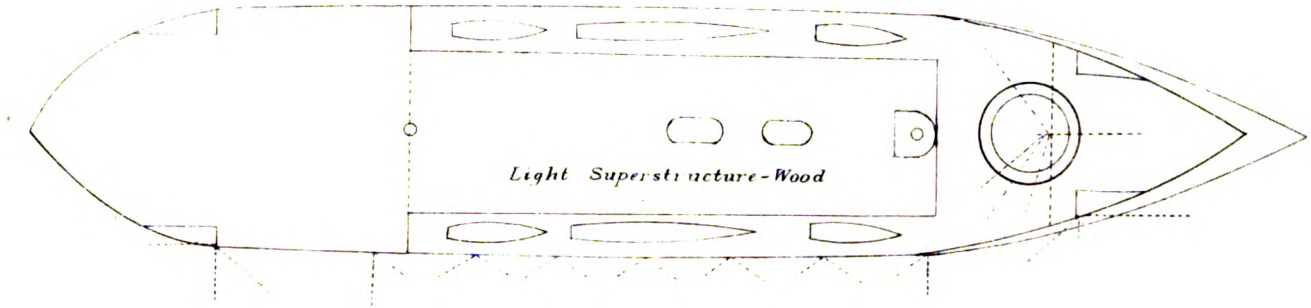


Belt
On Special Scale.

"Emperor Nicholas"
"Alexander II"





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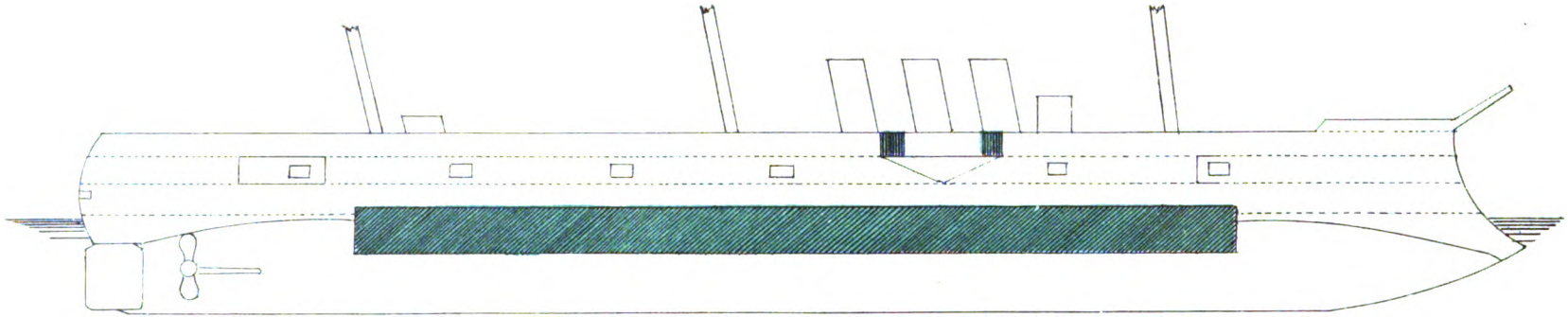
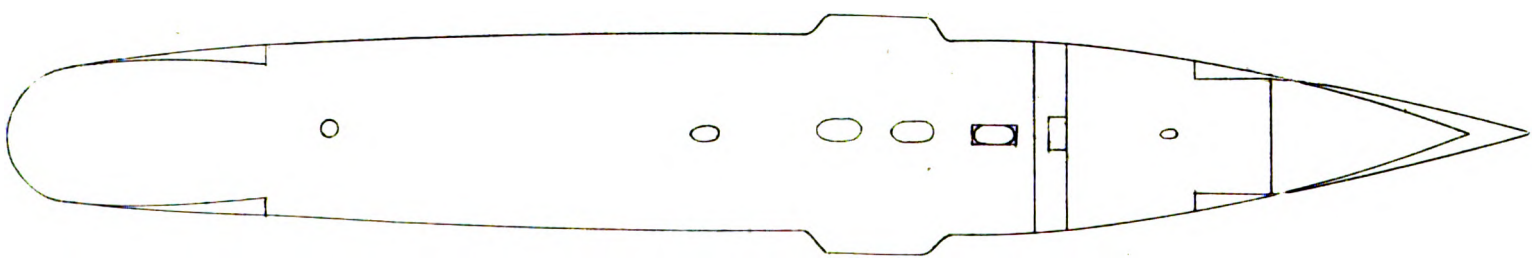


"Pamyat Azova."



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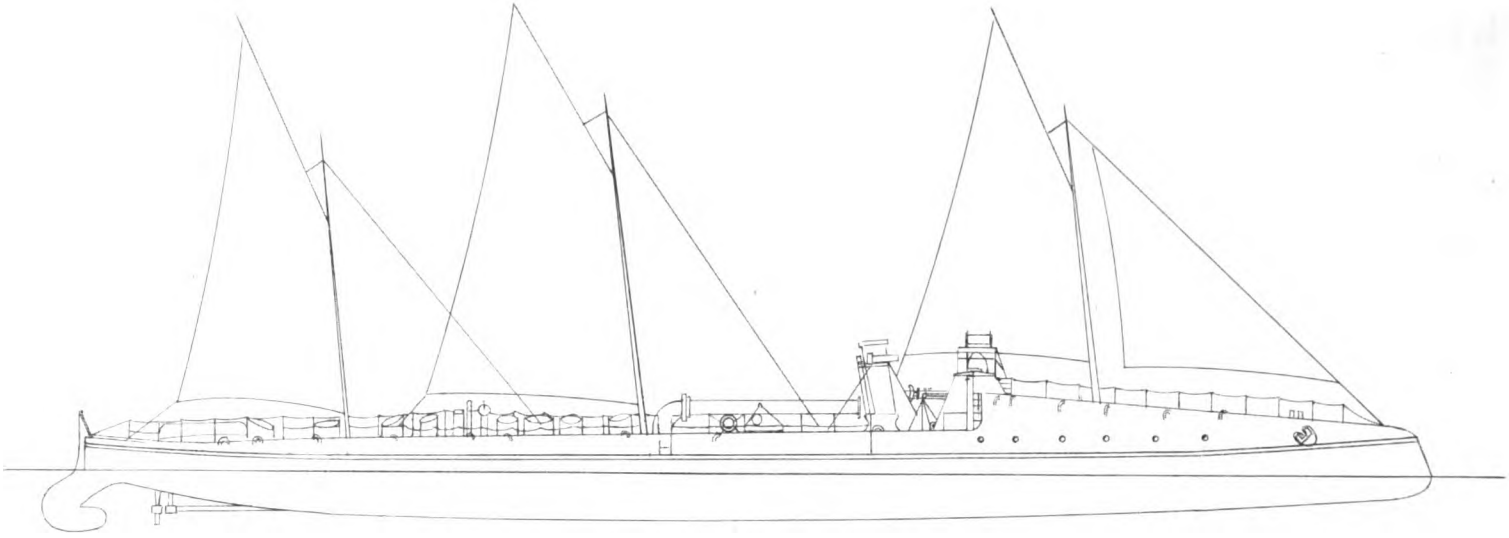
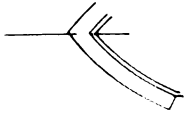
"Wiborg"



Special Scale



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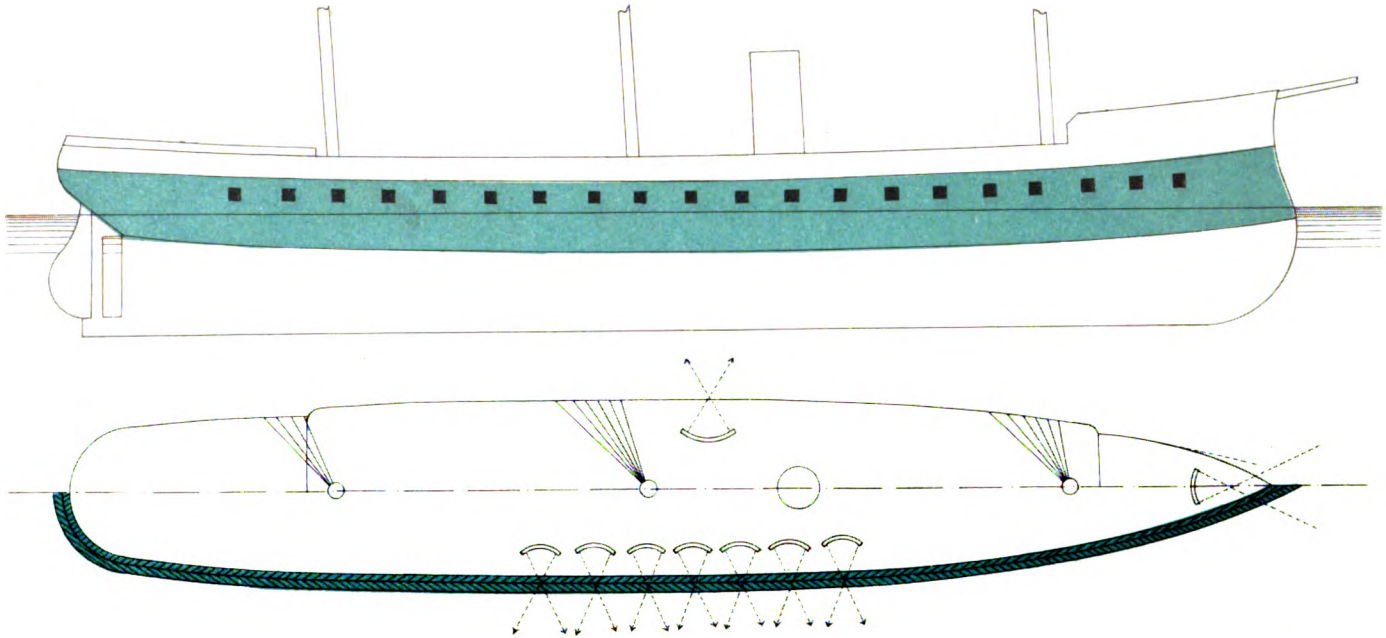
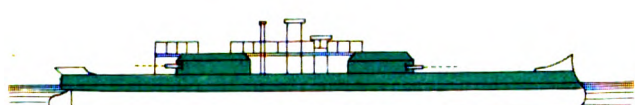
"Numancia."



"Puig-cerda."



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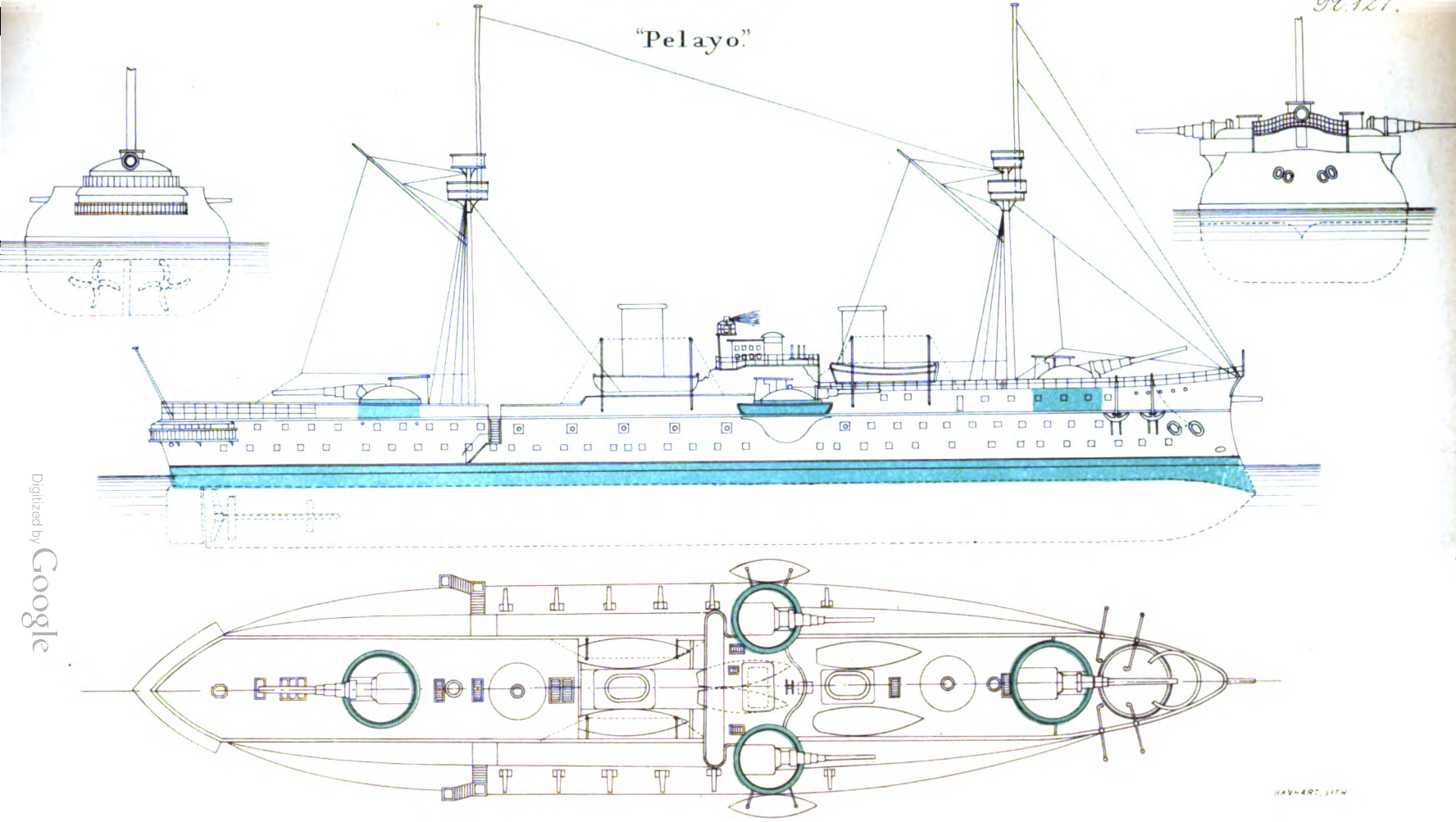
"Pelayo."



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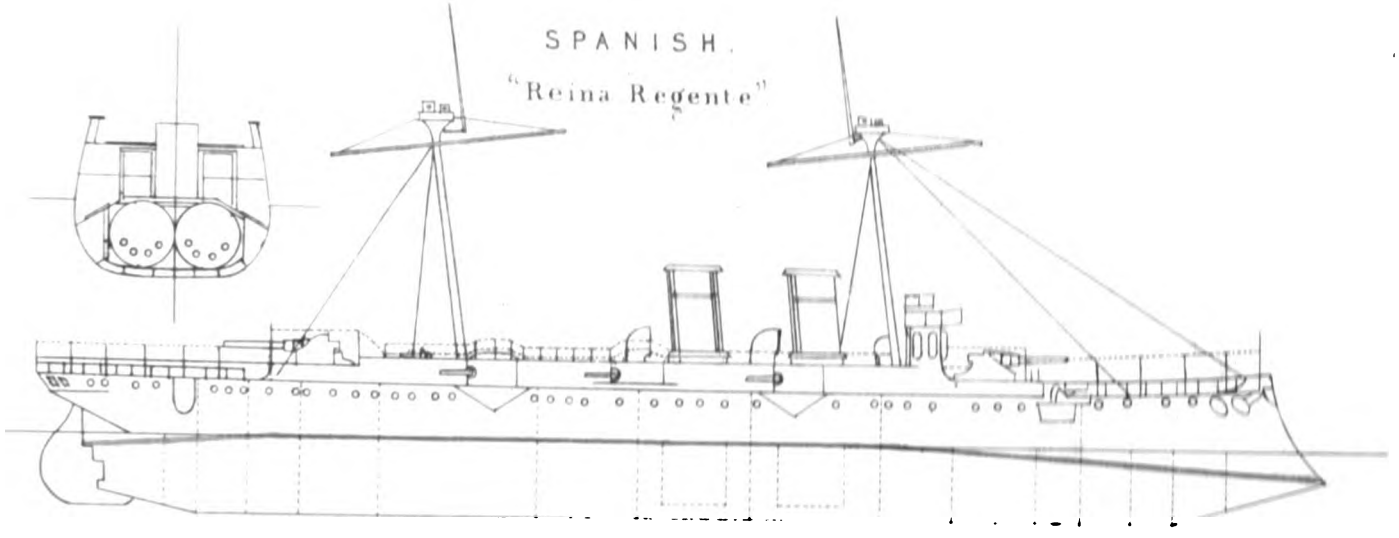
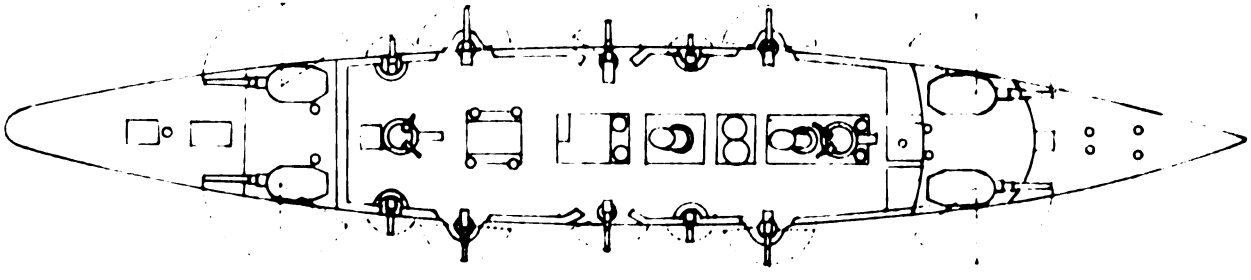
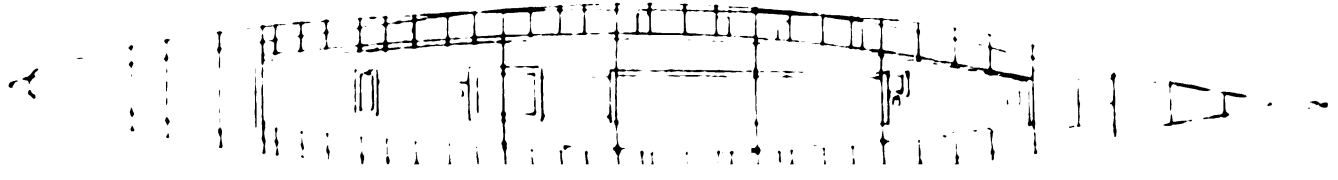
SPANISH.

"Reina Regente"







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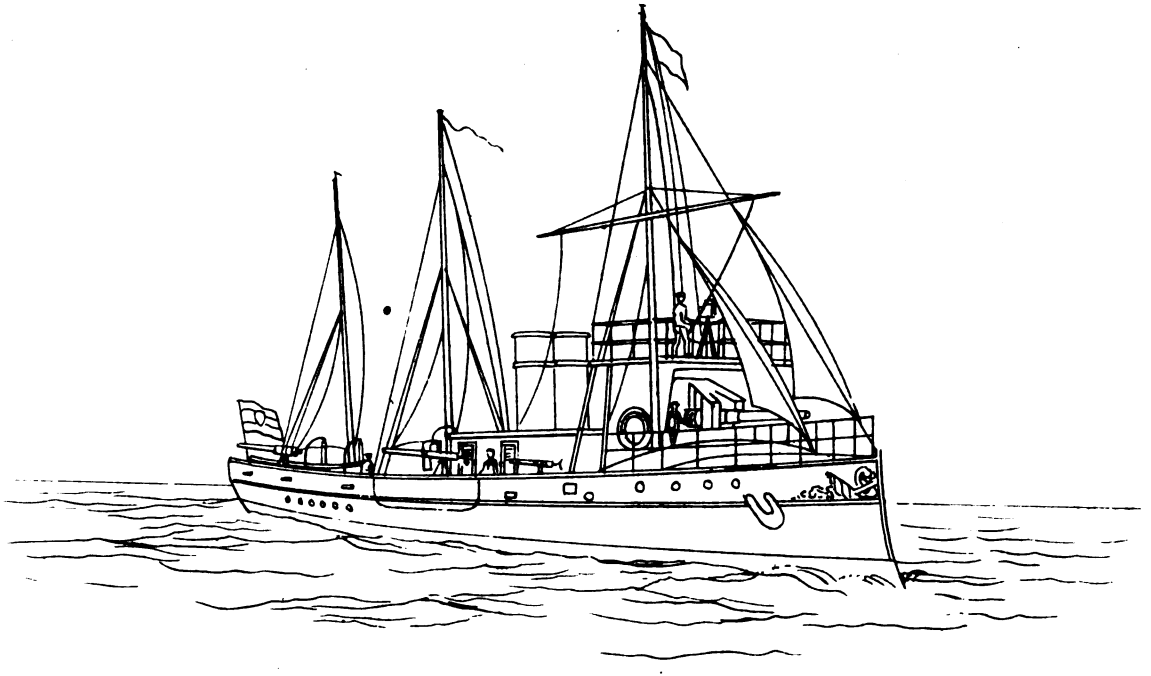
M.129a.

"El Destructor."
(Torpedo Cruiser)



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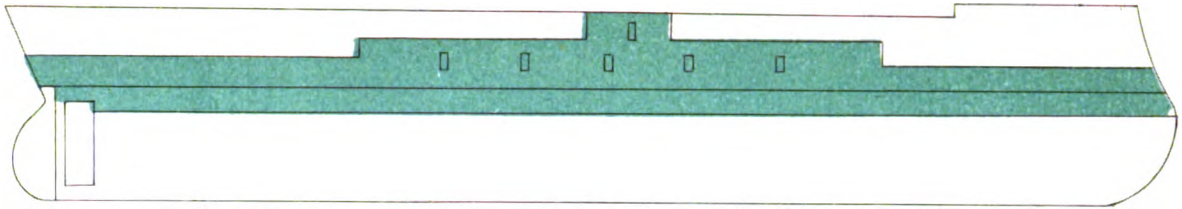
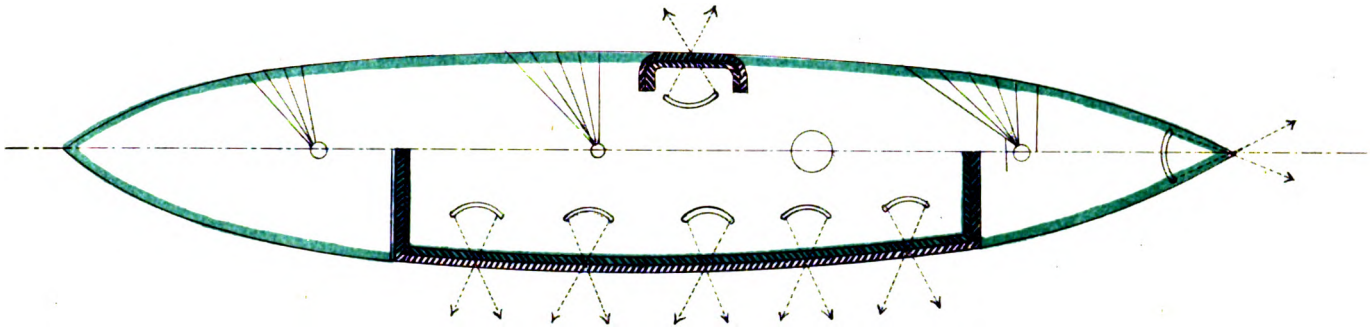
SPANISH.

"Sagunta".





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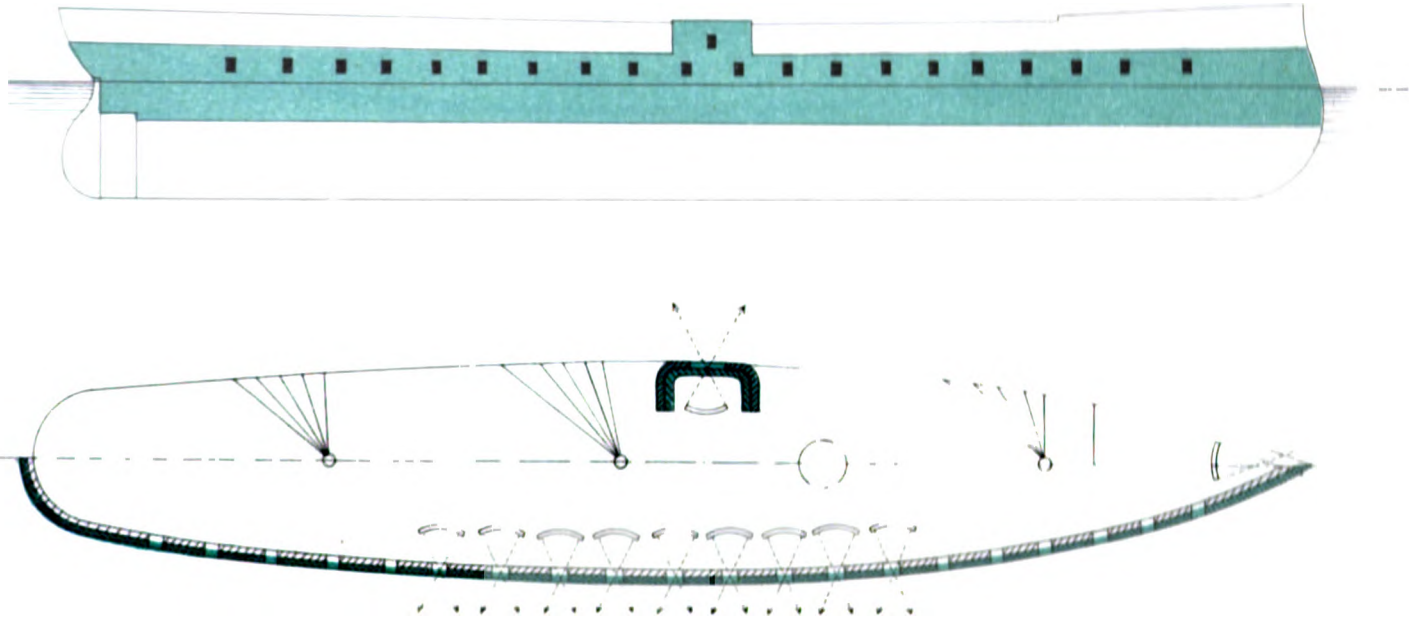
"Vitoria"



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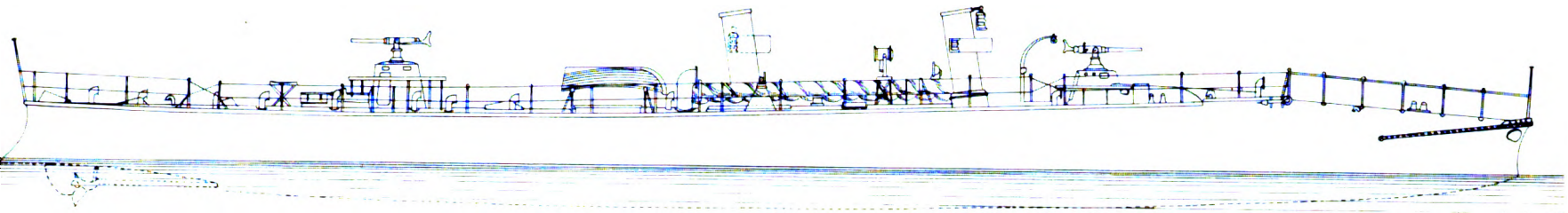
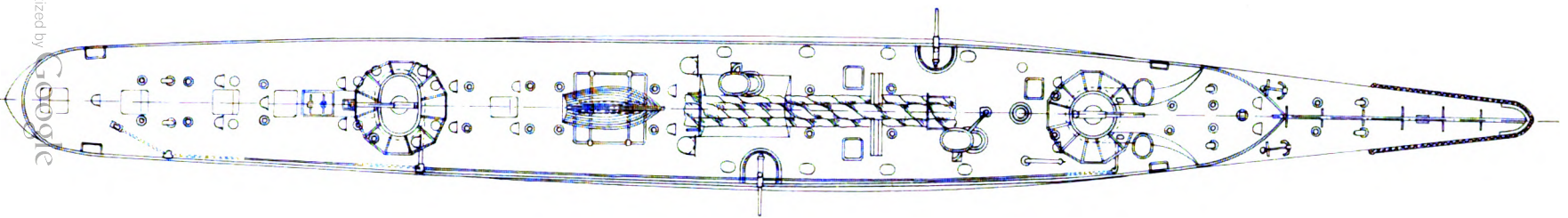
"Ariete" Thorneycrofts, Torpedo Boat.

On Special Scale





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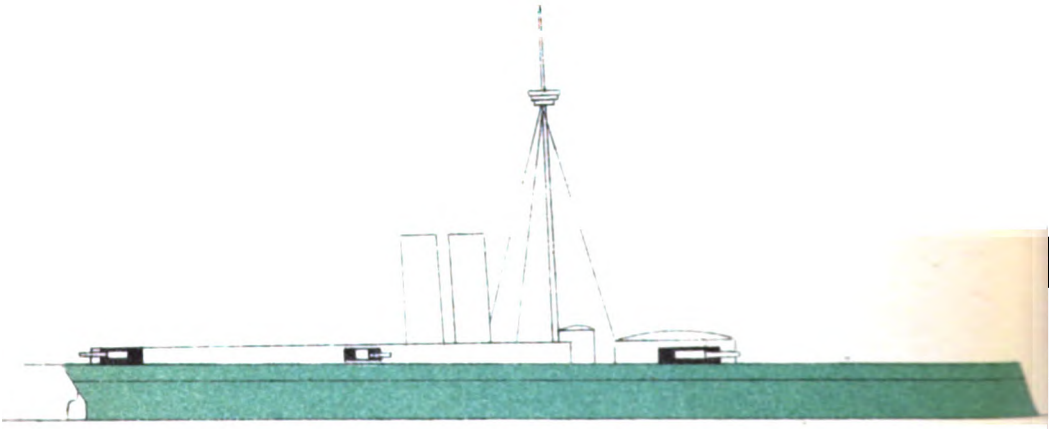
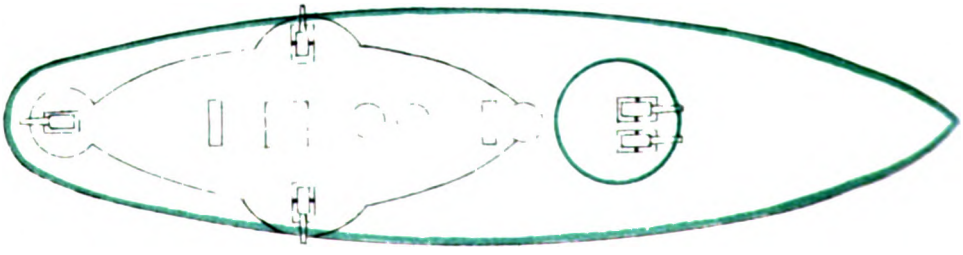
SWEDISH SHIPS

"John Ericsson"

"Svea".





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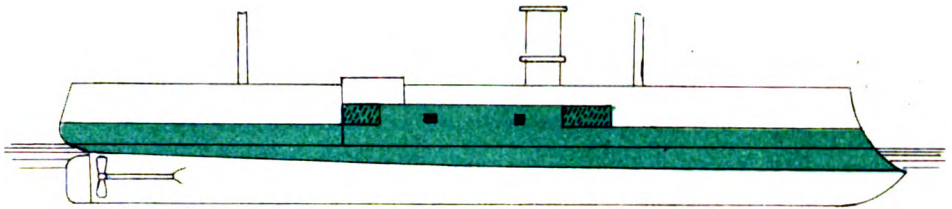
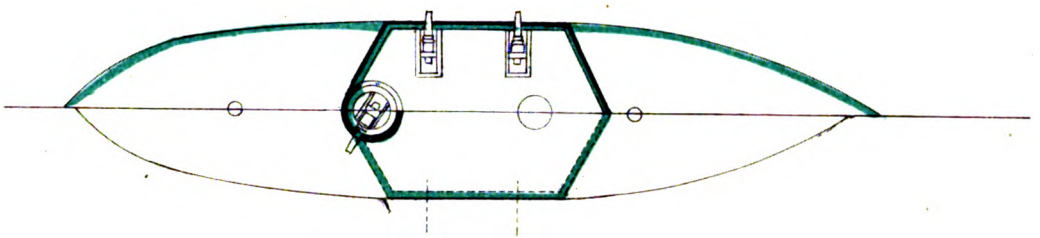
TURKISH.

"Assar-i-Schifket".





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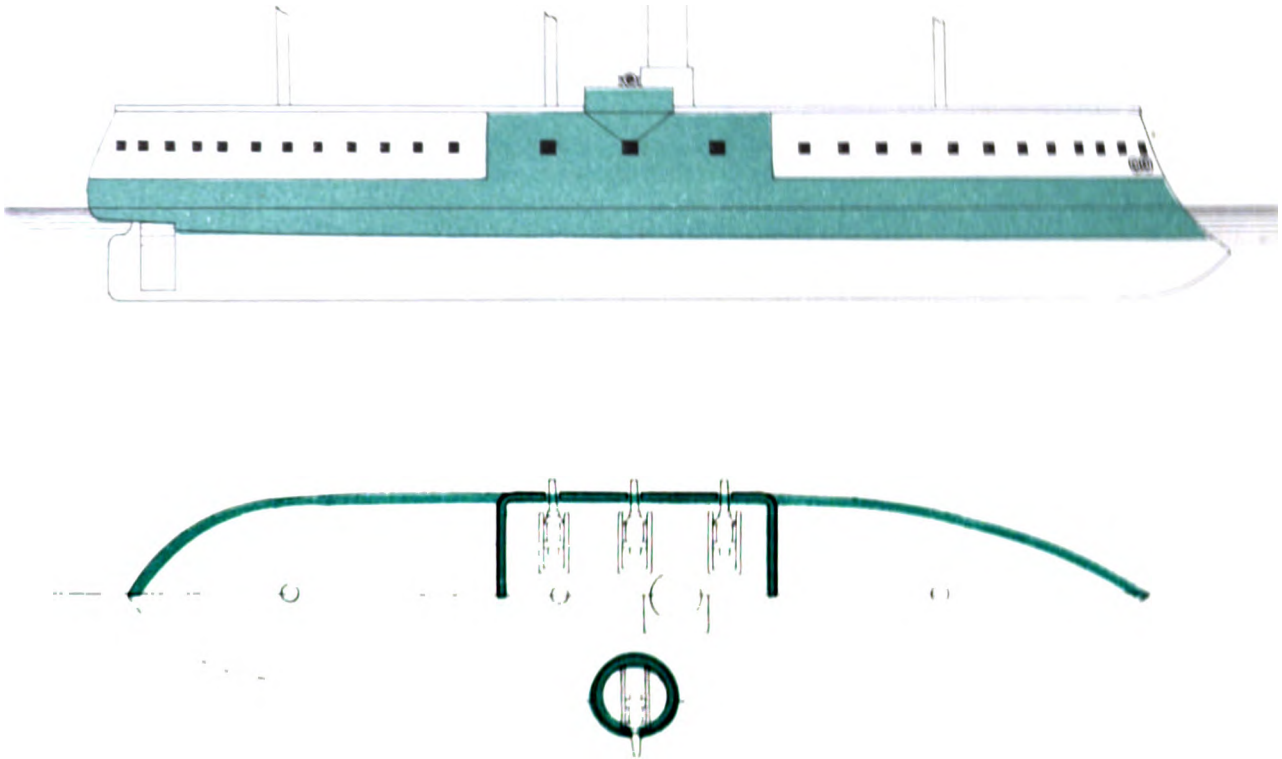
'Assar-i Tevfik"



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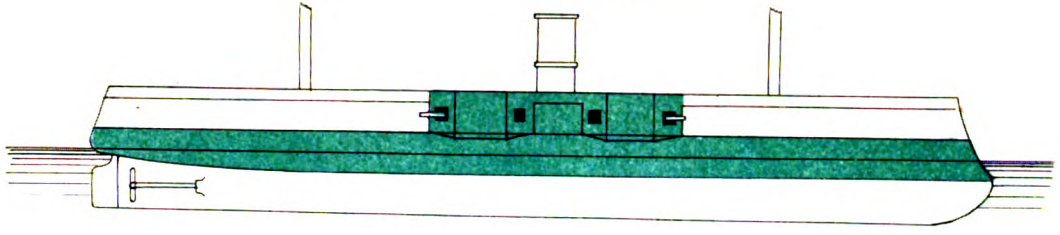
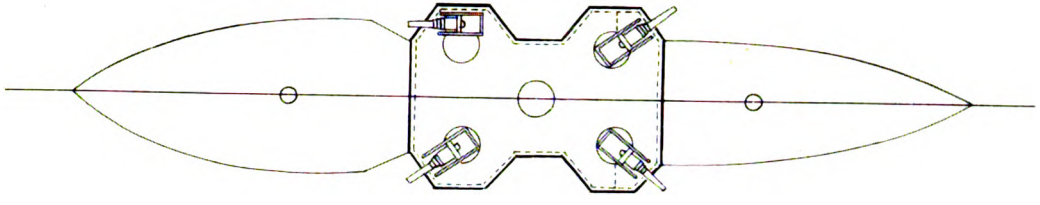
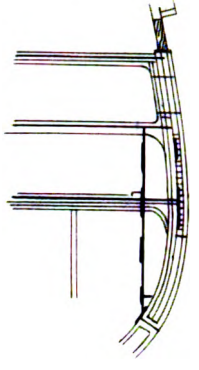
TURKISH SHIPS.

"Avni - Illah".

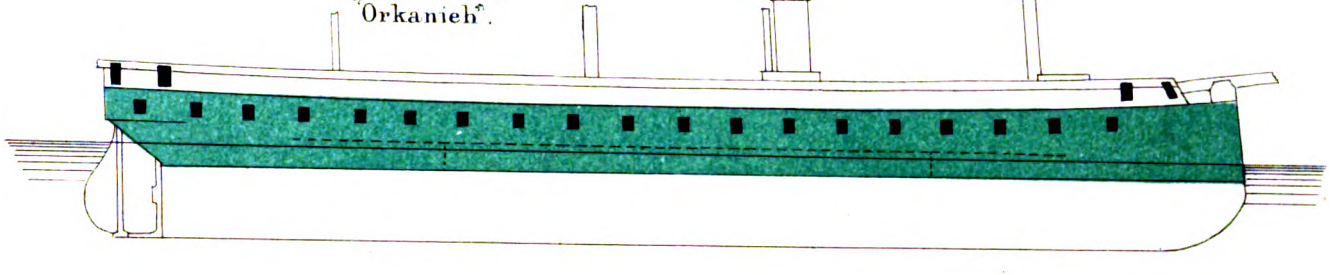




"Azazieh".



"Azazieh".
"Hamidieh".
"Orkanieh".



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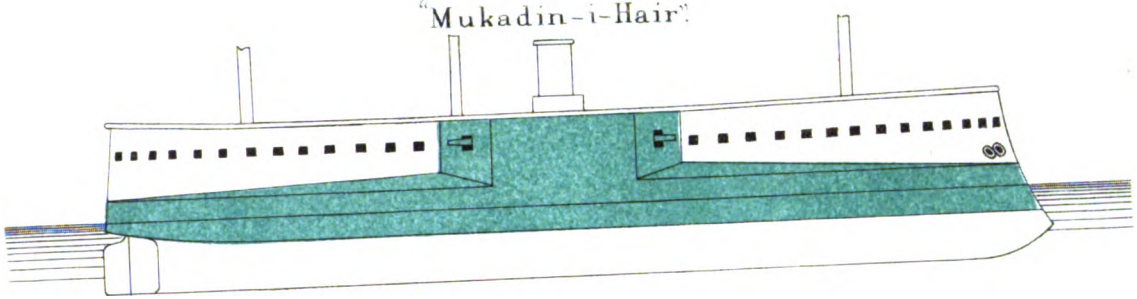
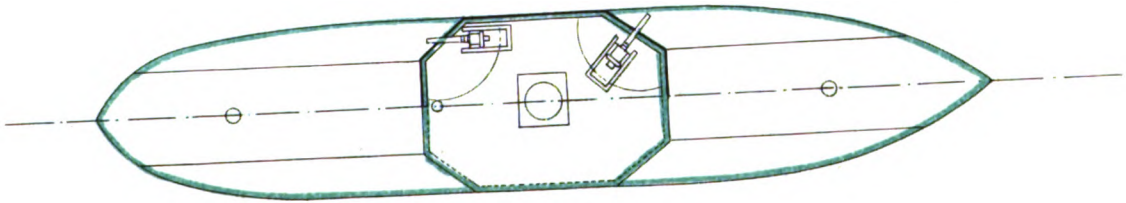
TURKISH SHIPS.

"Feth-i-Bulend."
"Mukadin-i-Hair".





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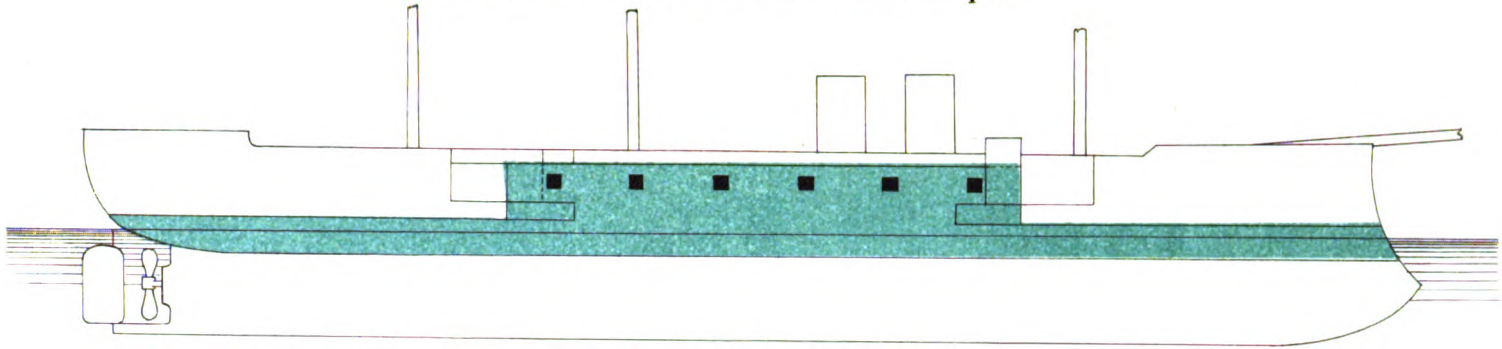
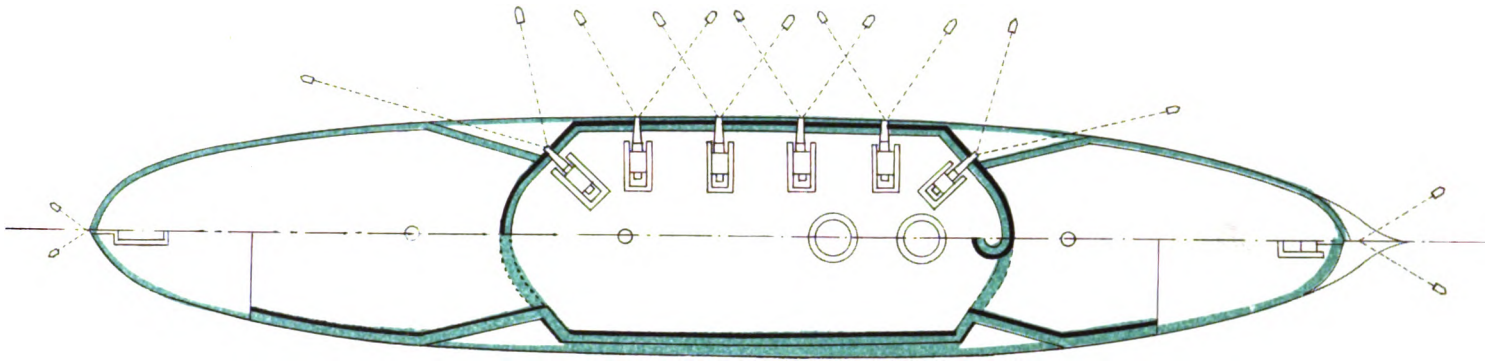
"Mesoodieh."
Sister to the British Iron-Clad "Superb".





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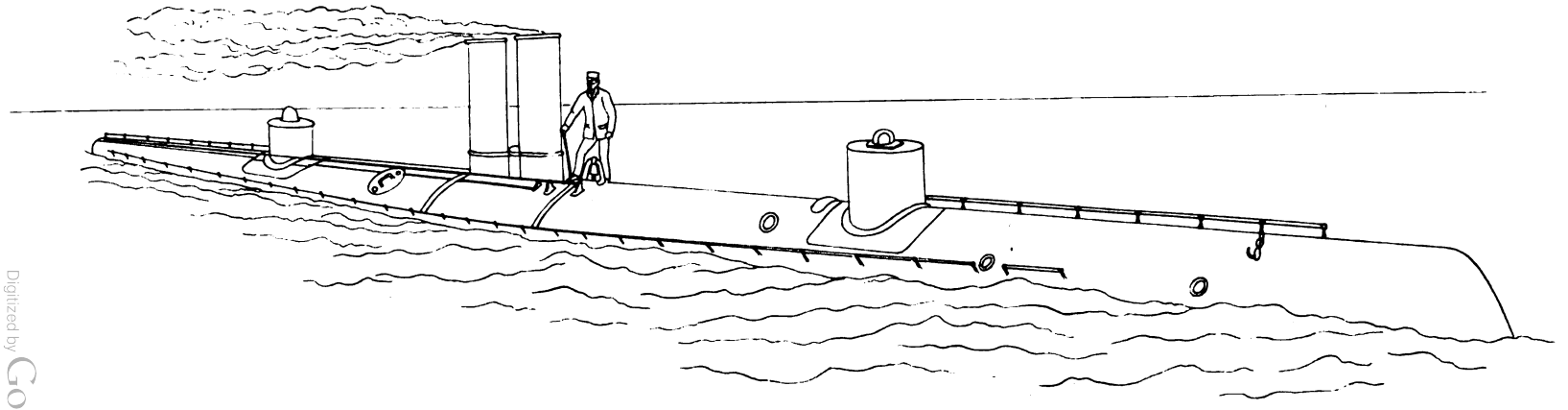
TURKISH SHIPS.

Submarine Boat "Nordenfelt."



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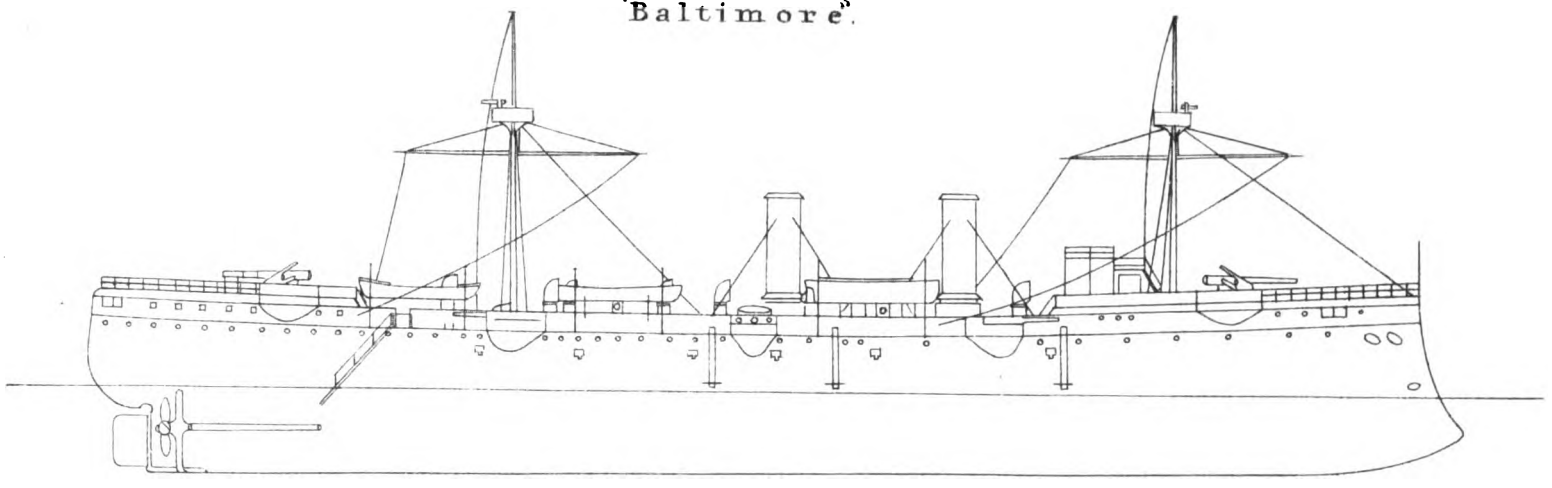
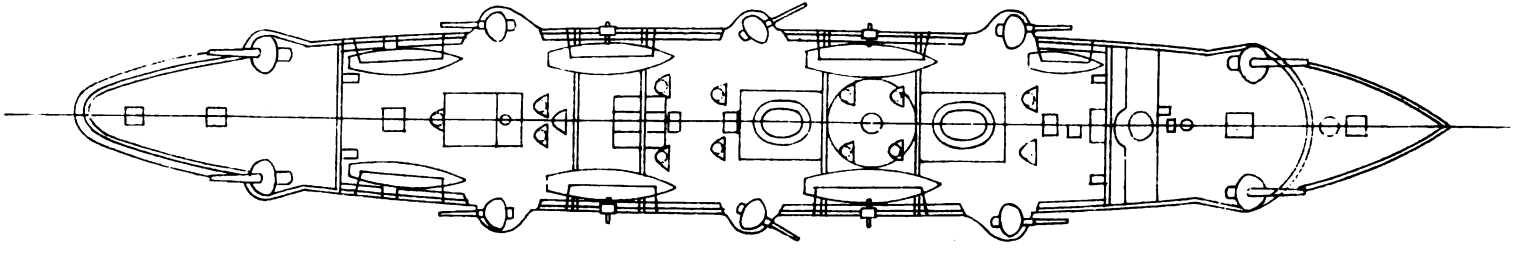
AMERICA-UNITED STATES SHIPS.

"Baltimore".





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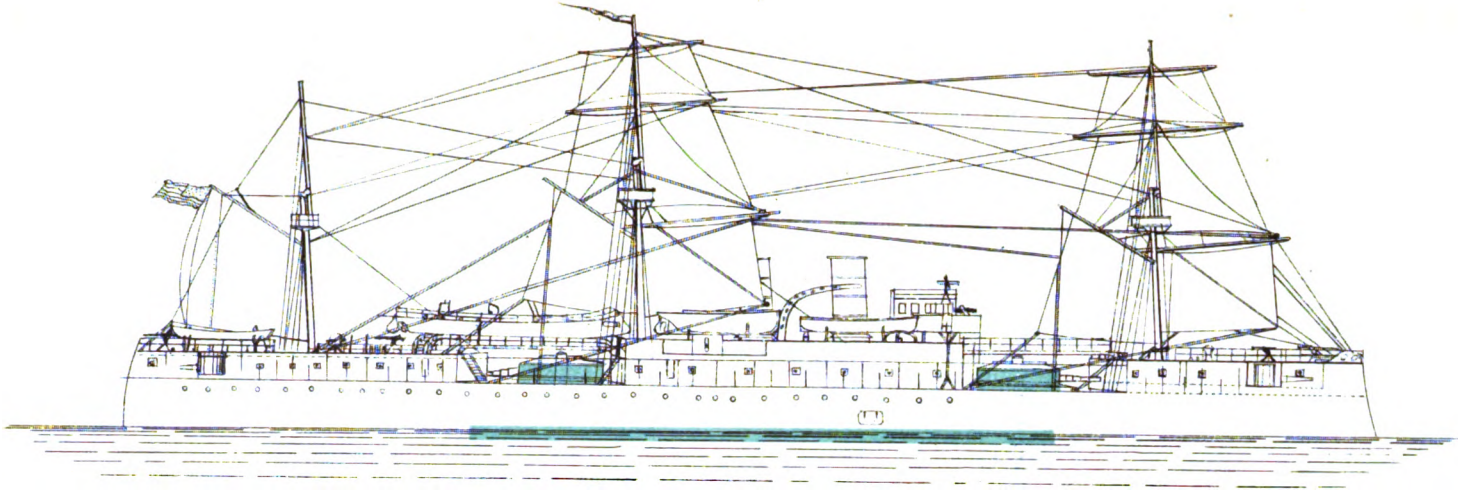
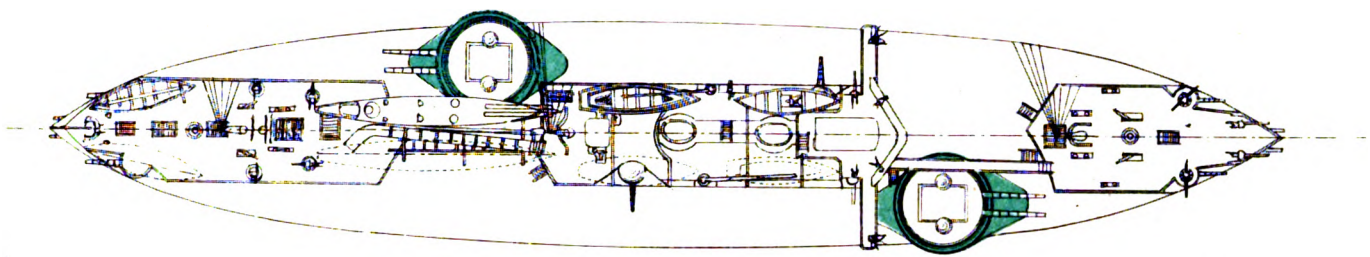
Armoured Cruiser
"Maine".





Main and Superstructure Decks

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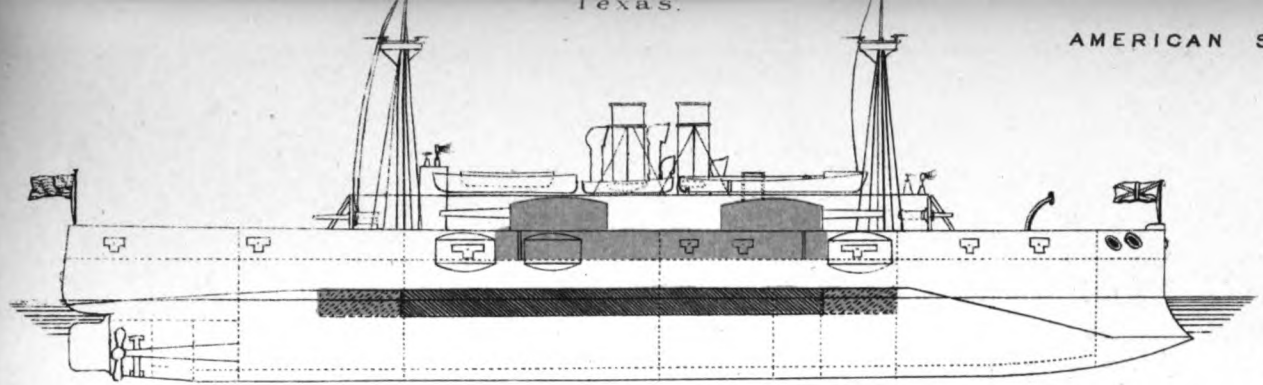
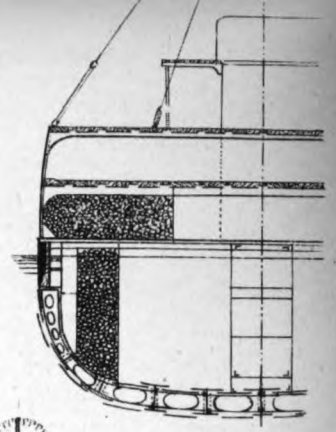
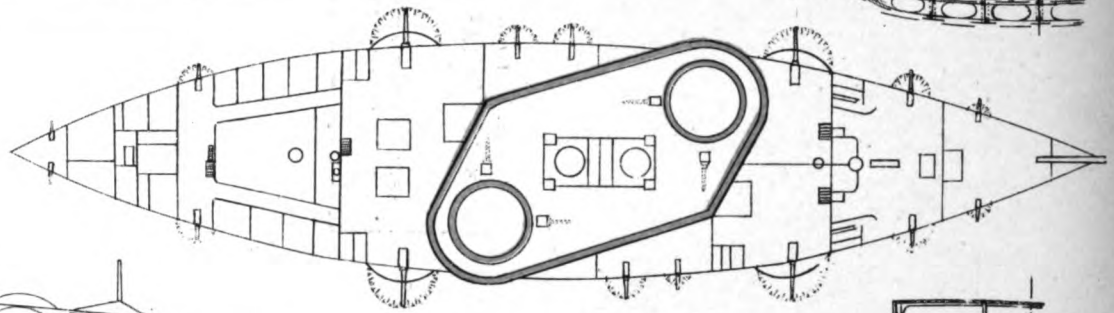
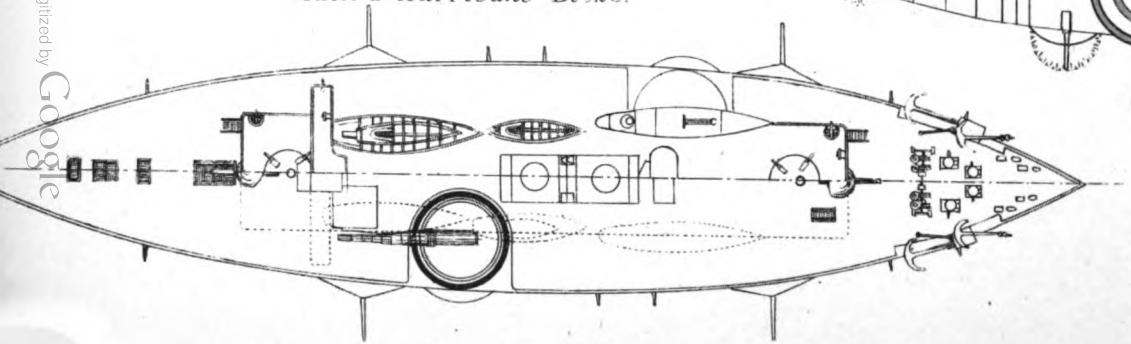
Texas.

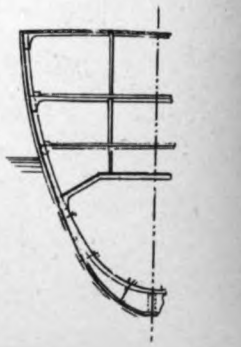






Main & Hurricane Decks.





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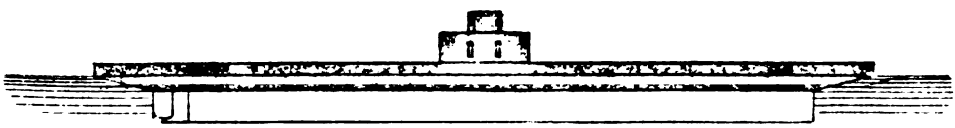
"Camanche"



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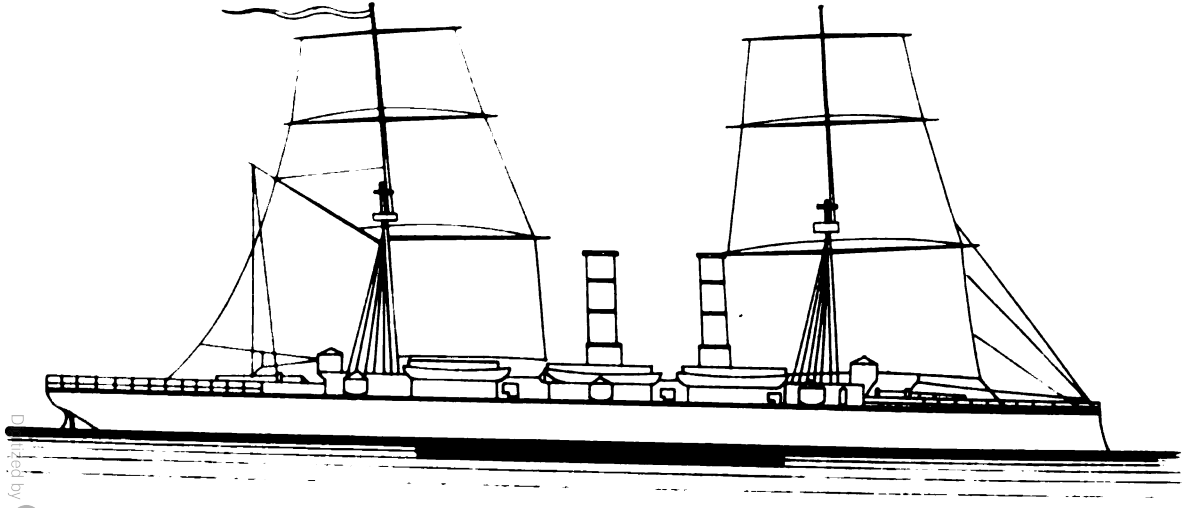
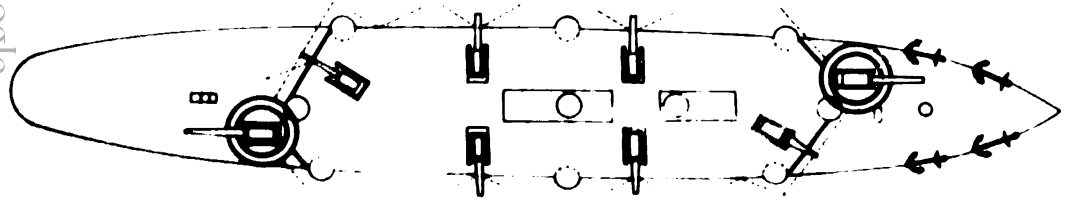
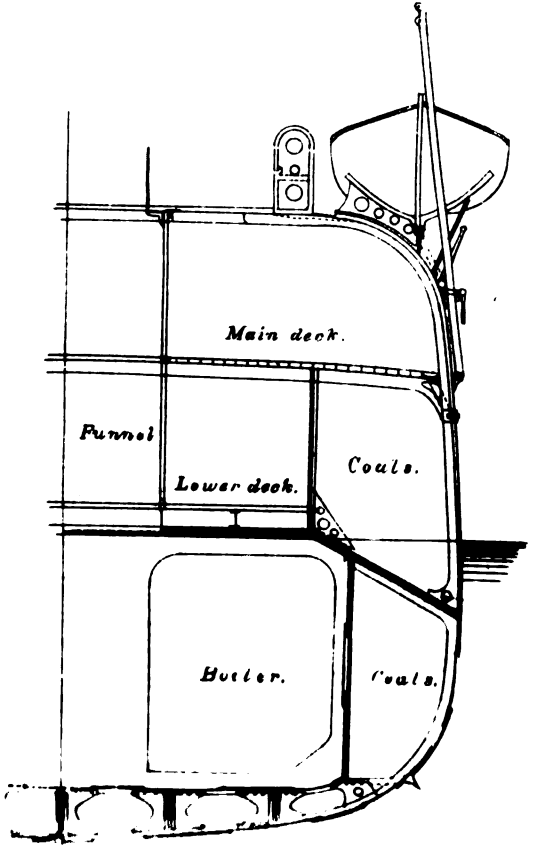
Pl. 140.

"Atlanta" & "Boston."







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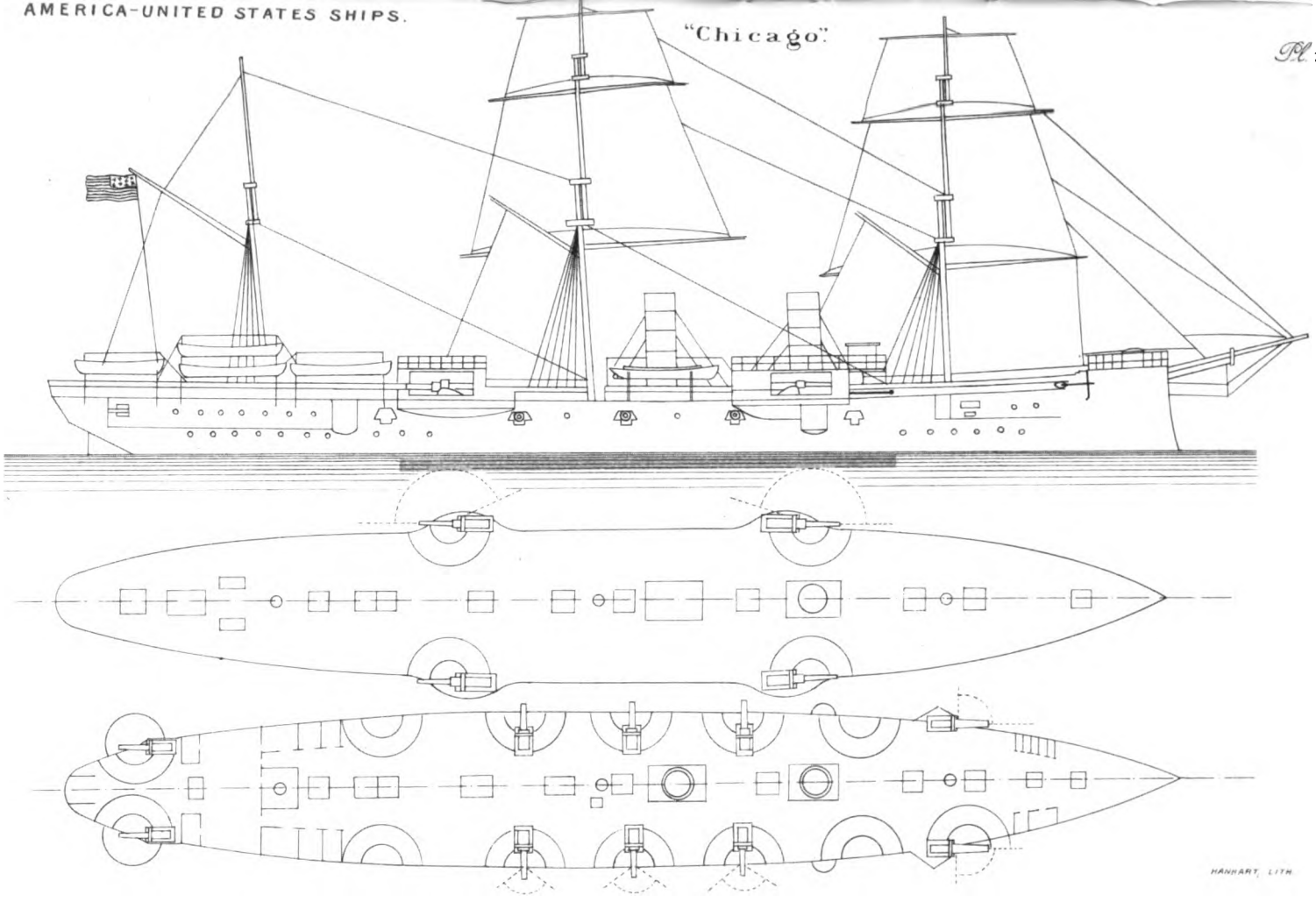
"Chicago"

Pl. 141.



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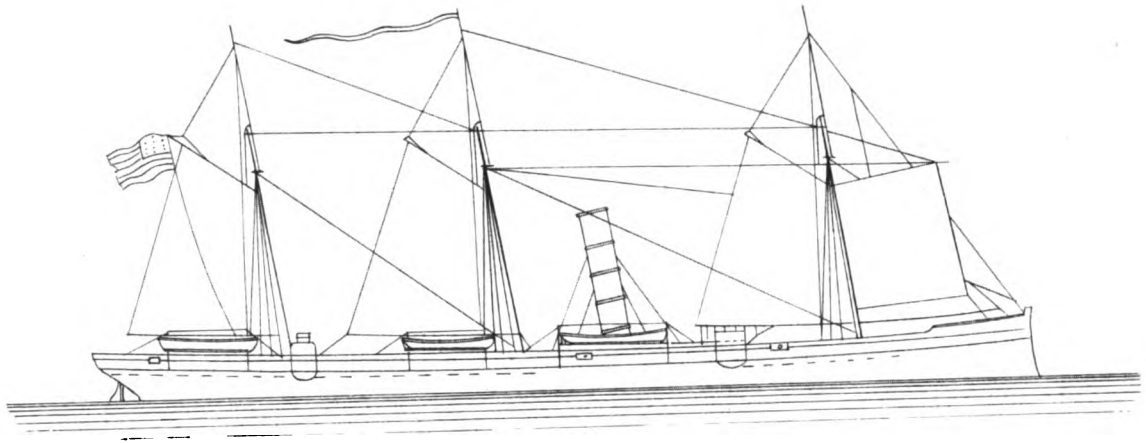
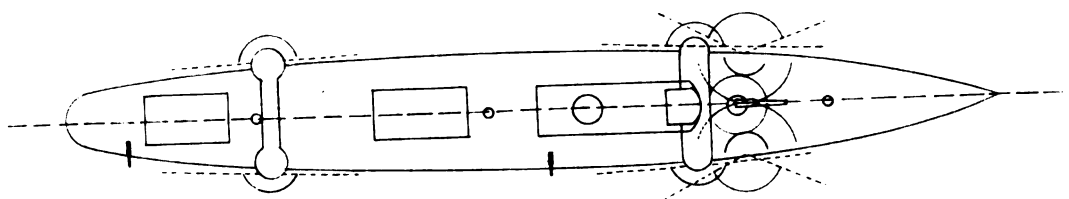
"Dolphin."





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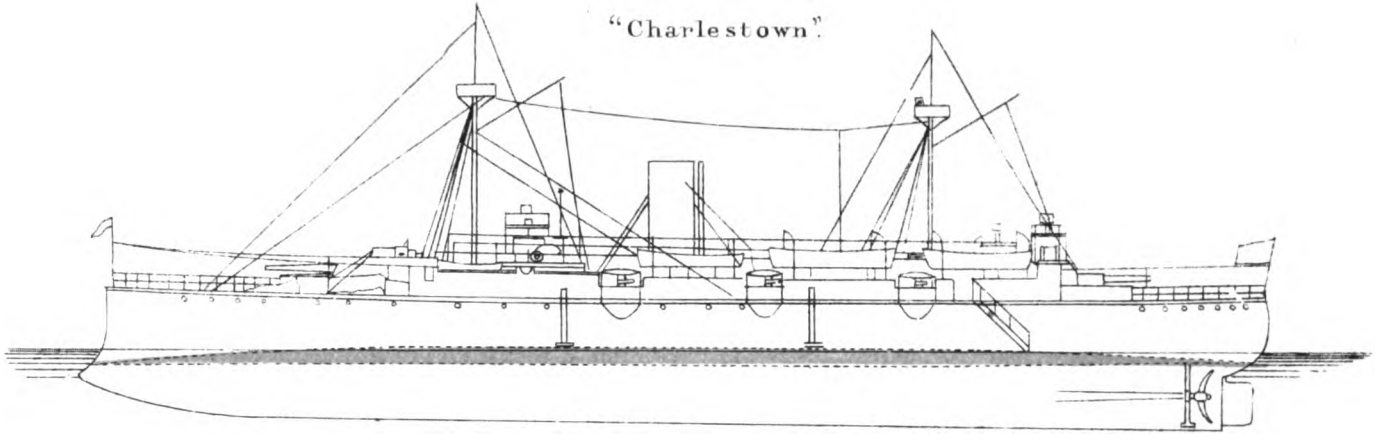
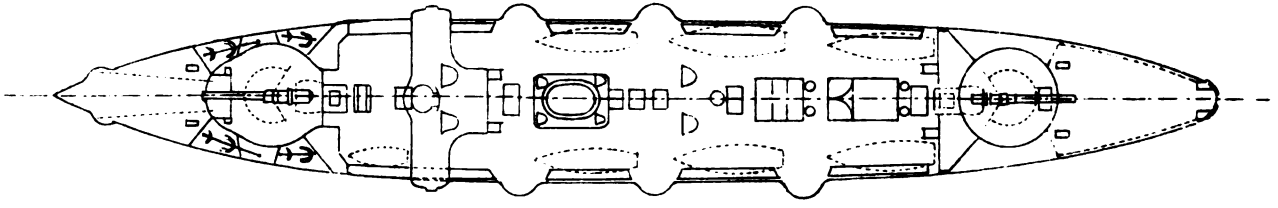
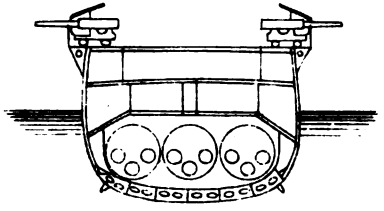
"Charlestown".







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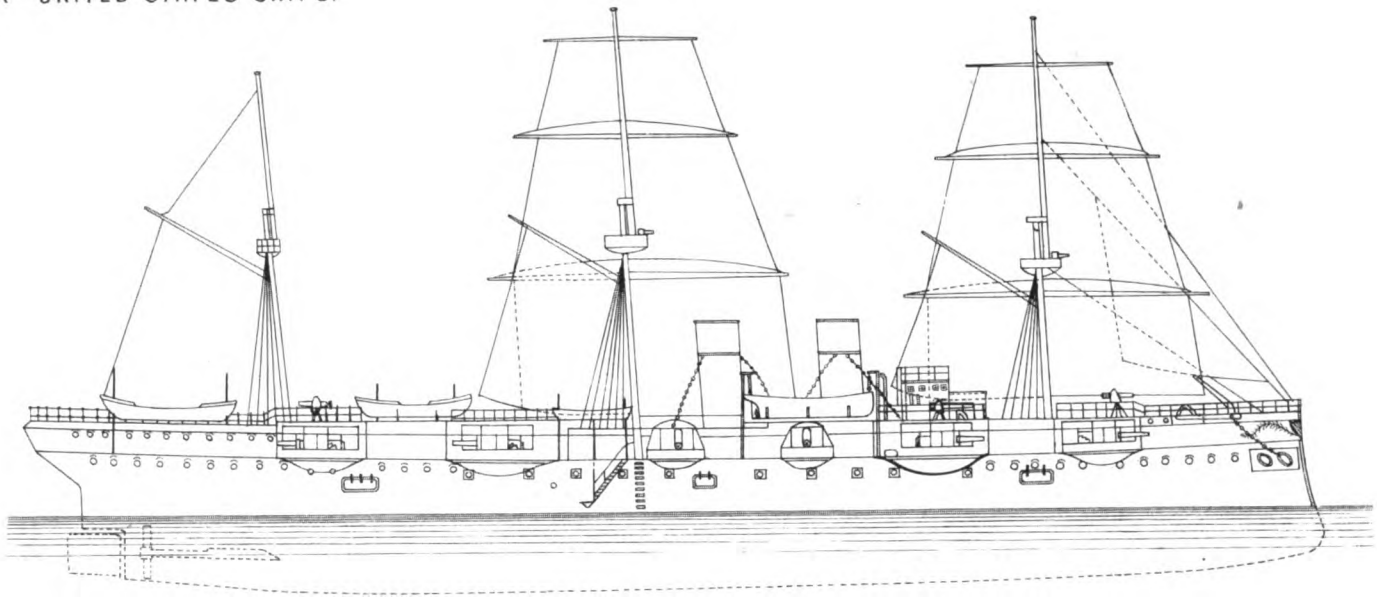
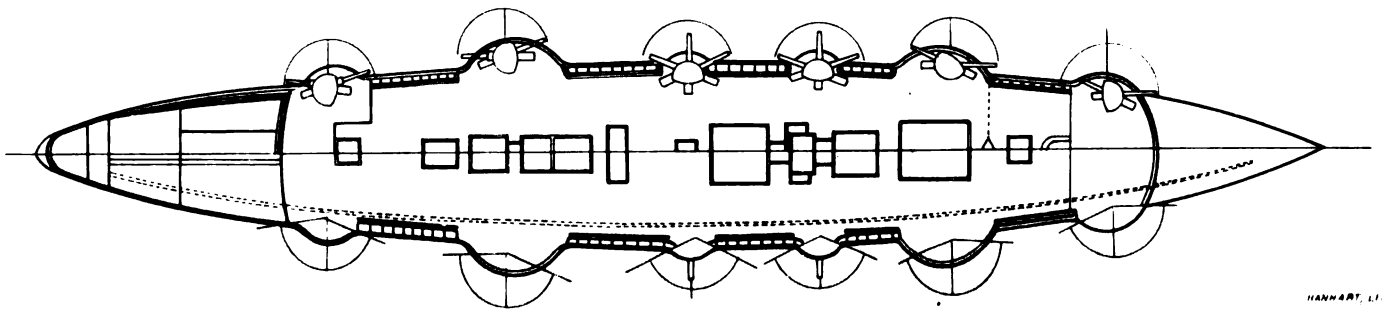
"Newark."





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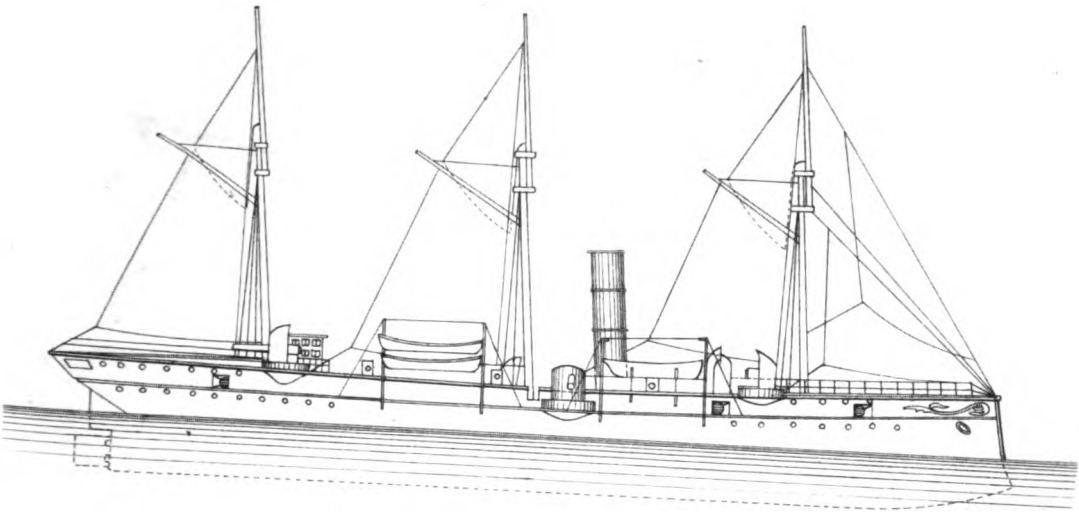
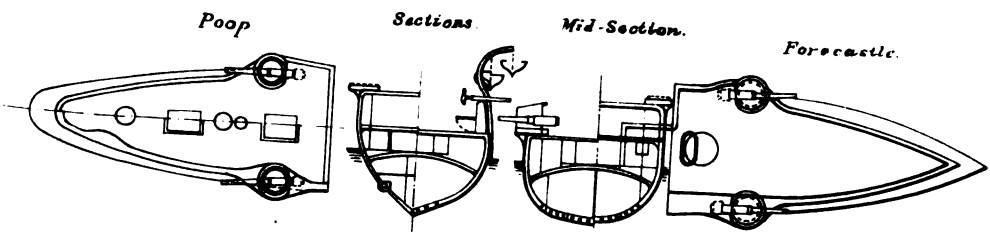
AMERICA—UNITED STATES SHIPS.

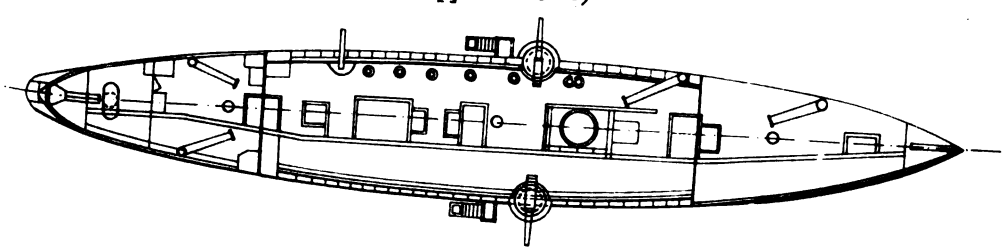
"York Town".

Torpedo Cruizer of 1700 Tons Displacement.





(Upper Deck)



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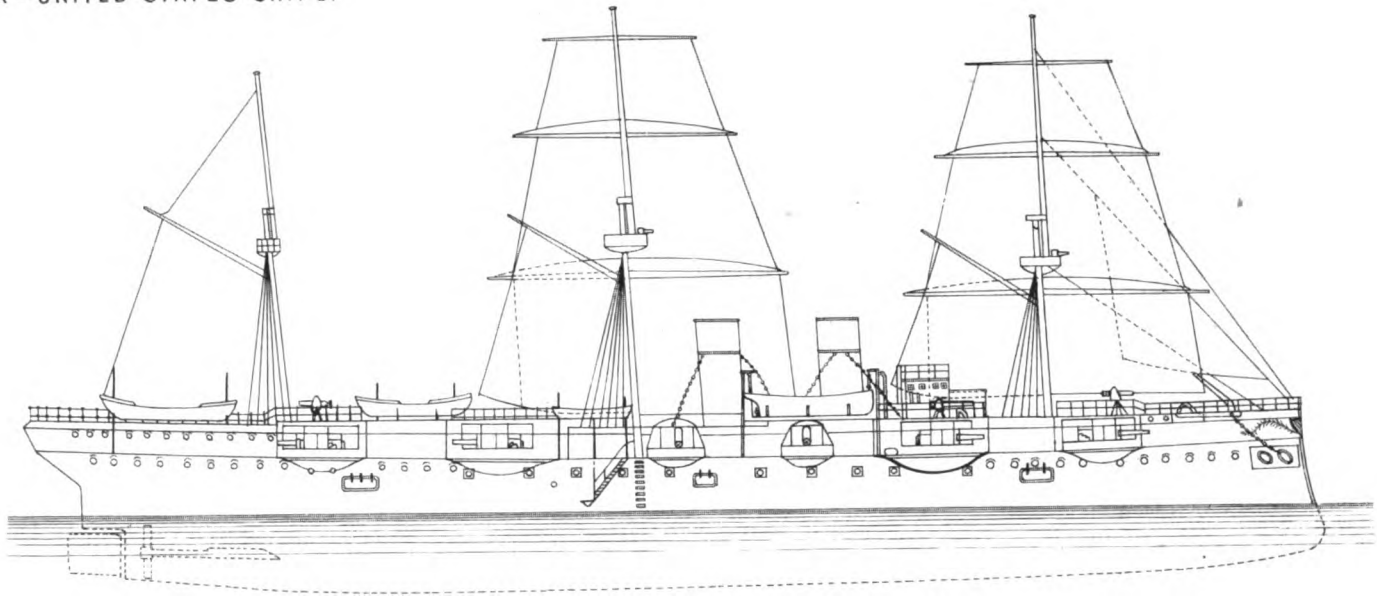
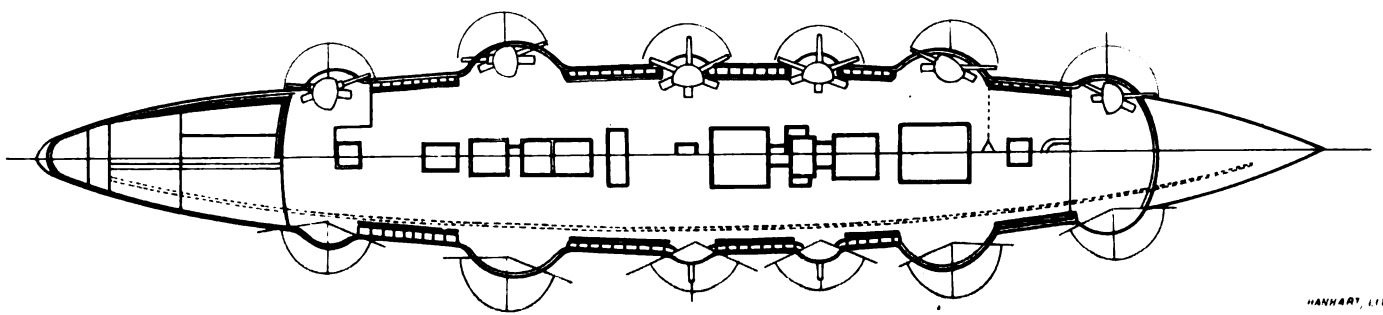
"Newark."





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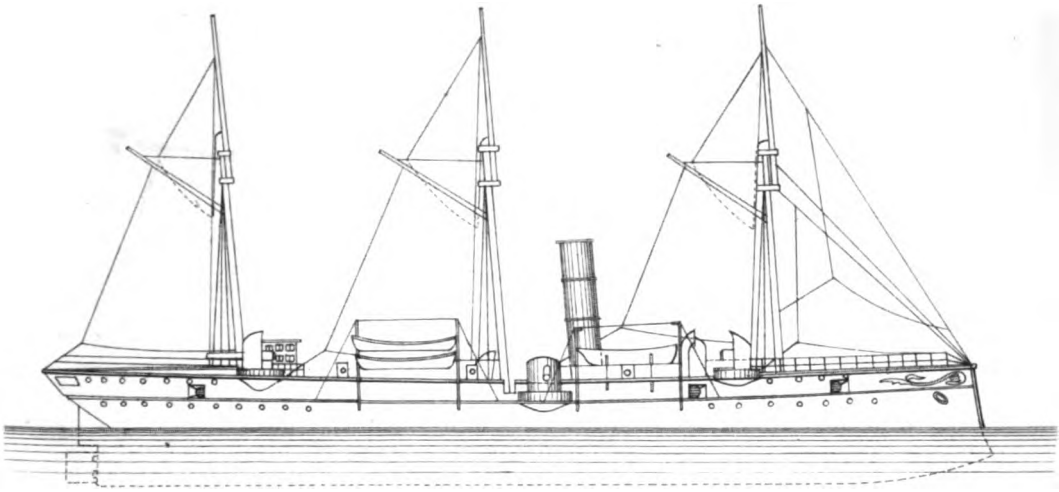
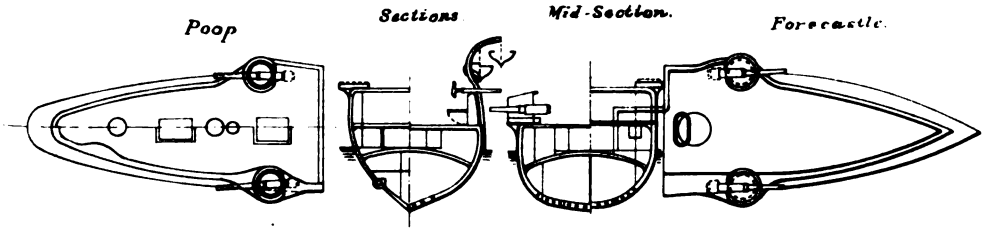
AMERICA—UNITED STATES SHIPS.

"York Town".

Torpedo Cruizer of 1700 Tons Displacement.





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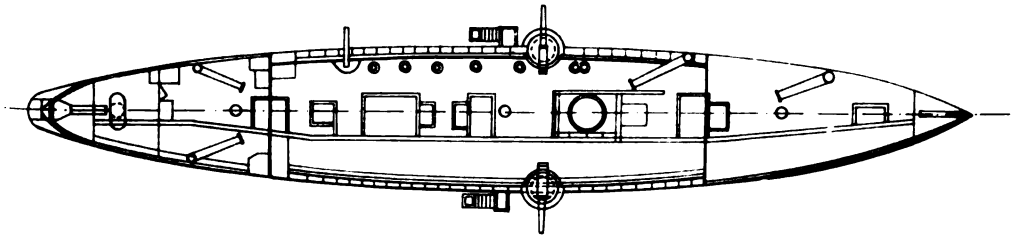

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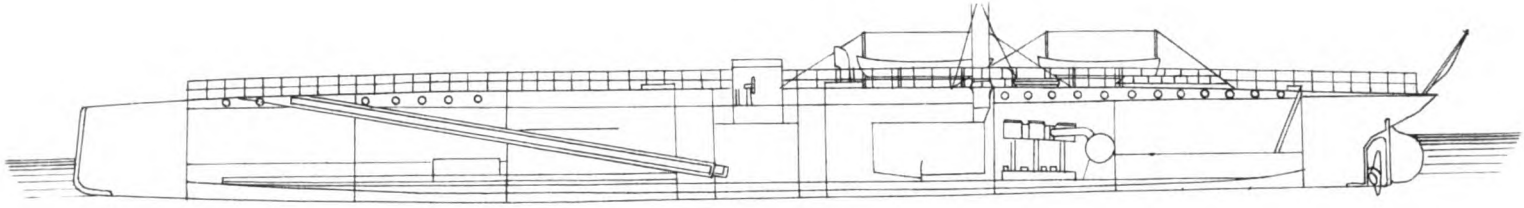
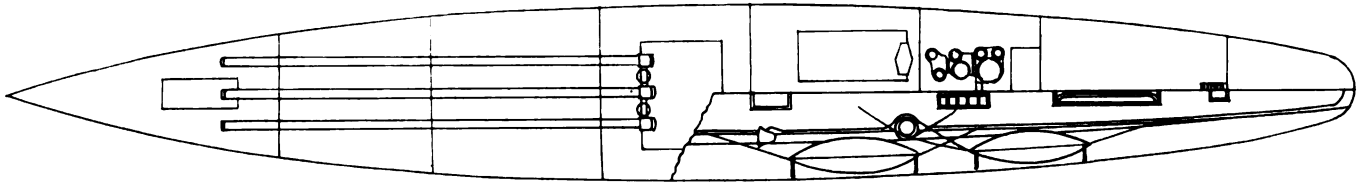
AMERICAN SHIPS.

Dynamite Gun Cruiser "Vesuvius".

on Special Scale





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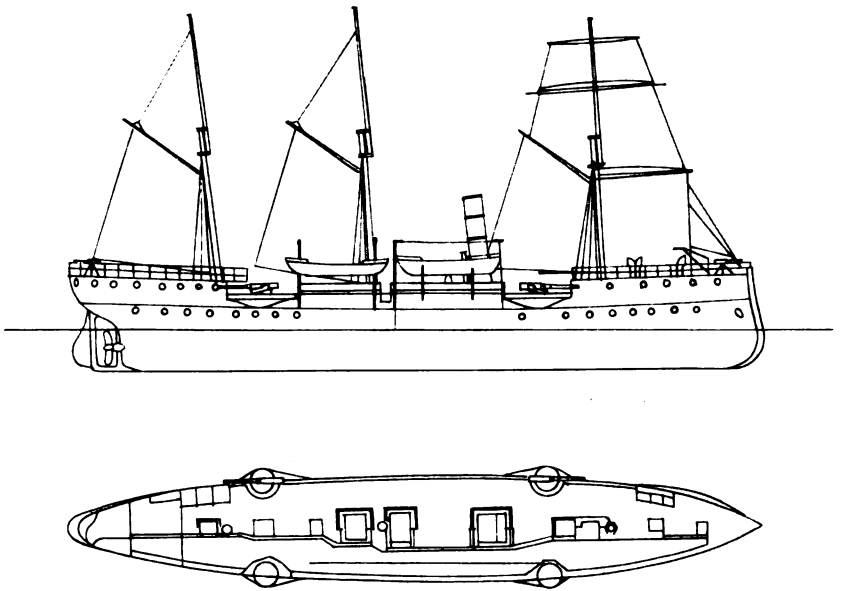
New Gun Vessel "Peterel".

of 890 Tons Displacement



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PART III.

ARMOUR AND ORDNANCE.

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PART III.

Armour and Ordnance.

CHAPTER I.

Armour and Armour Experiments.*

Nettle competitive plate trials.

The rapid improvement which has latterly been effected in the quality of armour-piercing steel projectiles has stimulated the efforts of the authorities to secure the best possible armour plates. Hence a new competitive trial of plates was commenced at Portsmouth on board H.M.S. Nettle at the beginning of the year 1888, in which a number of English firms were invited to submit plates of solid steel or of steel-faced iron. In France, although both classes of plate are made, it appears that officers generally have more confidence in the solid steel than in the compound plate. Messrs. Schneider are the only makers of solid steel armour who can claim any lengthened experience, for the Terni works in Italy have been practically started and helped forward by them. Consequently it was very desirable to obtain plates from Messrs. Schneider to try in comparison with our English plates. This unfortunately we have failed to do, the terms on which Messrs. Schneider offered to submit plates having been considered altogether unreasonable. Thus the Nettle competition has been limited to the products of English manufacture, and the only means we have of comparing our own plates' powers with those of Messrs. Schneider consist in referring to achievements on other occasions. This is subject to the disadvantage of not being able to estimate and allow accurately for the variation in conditions, and for the constant improvement which is to be looked for as time goes on. Among these varying elements is that of the quality of the projectiles employed in the attack, which alone is a most important one, so that the absence of Schneider's plates is greatly to be regretted; nevertheless a competition has taken place, of which the results are more valuable and

Competition limited to English firms.

* *List of Authorities.*—Cuts and descriptions from the *Engineer*. Facts are also taken from the U.S. Intelligence Department publication entitled *Information from Abroad.*

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more satisfactory than could have been expected under the above circumstances. The results are not allowed to be published at present, and although a few imperfect reports of the earlier trials have been printed in various papers,* a full review of them can only be taken when they are completed, when it is possible that facilities will be given by the Admiralty.

Swedish Trial of Schneider's Steel Armour.

Trial of Schneider's steel armour.

The *Army and Navy Register* of January 3rd gives an account of a trial of solid steel plates supplied by Schneider & Co. for the Swedish armour-clad Gota. The trial is valuable as furnishing a standard of comparison with our own steel-faced plates tested recently on board the Nettle. The dimensions of plate and power of the attacking gun are not quite the same as those employed in any trial of ours, but their relative powers and the general approximation of the conditions certainly give it a special value to those who have access to the Nettle results. The elements of the experiment are as follows. Three rounds were fired:—

Plate	Plain rectangular.
Length	6·5 ft.
Breadth	4·86 ft.
Thickness	9·56 in.
Weight	12,676·6 lb. (5·66 tons.)
Gun	6 in. of 36 calibres.
Projectile	Hard cast iron.
Weight of projectile	99·2 lb.
Powder	Brown prismatic.
Weight of charge	35·2 lb.
Number of shots	3
Triangle	14·7 in.
Mean velocity of projectile	1838 foot seconds.
Distance of plate from gun	183·7 ft.
Penetration, first shot	3·8 in.
„ second shot	3·4 in.
„ third shot	3·6 in.
Swelling at back of plate, first shot	0·2 in.
„ „ „ second shot	0·2 in.
„ „ „ third shot	0·3 in.

Results.

All the projectiles were broken, and the swelling at the back of the plate opposite each shot-mark is reported as so minute that the photograph does not show it. The cuts on Plate I. in Part III. show the behaviour of the plate. Figs. 1, 2, and 3 show the plate after the first, second, and third rounds respectively. Fig. 4 shows the back at the conclusion of the trial.

The value of the results is very much less than would be the case if steel projectiles had been employed. Judging as far as is possible from the effect of the chilled shot, the total resisting power of the

* See *Army and Navy Journal*, published at 240, Broadway, New York, May 26, 1888, and U.S. official *Information from Abroad.*

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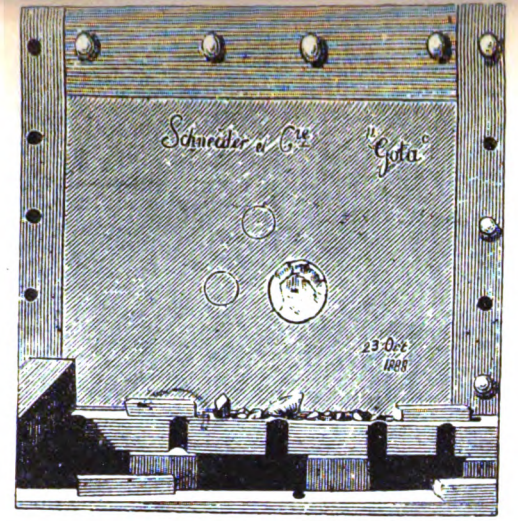

FIG. 1.

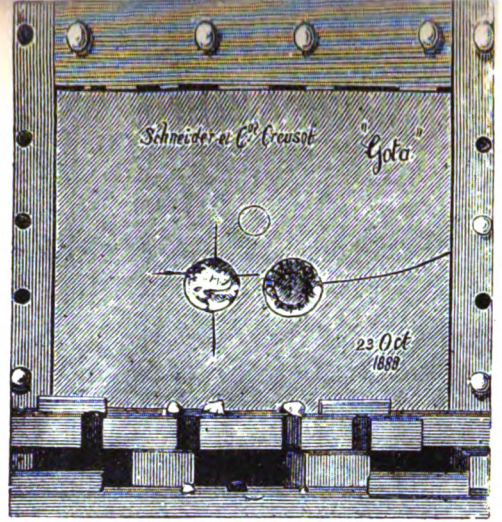

FIG. 2.

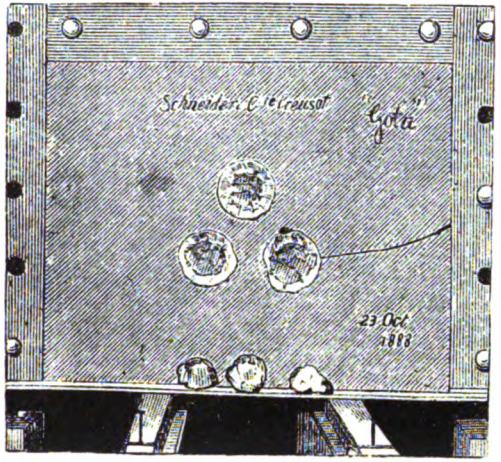

FIG. 3.

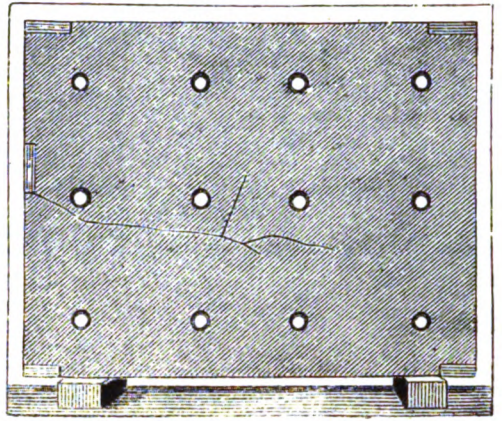

FIG. 4.

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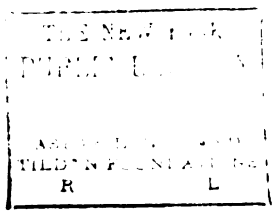
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steel is by no means greater—but rather less—than would be offered by the best steel-faced plates made in this country. The mass of the plate is rather harder and stiffer than our steel-faced plates. It may be observed that after the second blow a crack is developed, not from the second point of impact, but from the first, to the edge of the plate. Seeing that this crack does not run from the second shot, it appears probable that it was really initiated by the first shot from which it takes its origin—vide Fig. 3. It may be concluded also from Fig. 4 that it is a through crack, the front and back cracks being exactly opposite to each other, remembering, of course, that the back must be reversed to fit it to the face. This plate, then, is more than half broken in two. The best thing to be said for it is, the second and third blows did not actually complete the division. The velocity above may be that at the muzzle, but there would be little decrease in the 183·7 ft. range, and we may give it the benefit of any doubt, and take it as the striking velocity. This gives a total striking energy of 2261 foot-tons, and a power of perforation of 11·42 in. of wrought iron, or about 9·14 in. of steel-faced or steel armour. The actual plate was 9·56 in. thick. A good forged steel shell might have been expected to get its point well through and to stick, but a chilled shot breaks, and with so imperfect a delivery of energy that it could not be expected to do more, if as much, as is shown in these cuts. We may point out finally that the weight of this plate is nearly 504 lb. per cubic foot. Steel-faced armour averages about 480 lb. per cubic foot; that is, the steel is 5 per cent. heavier in this instance. This is a surprisingly large difference. It is only recently that it has been pointed out that compound steel-faced plates weigh 2½ per cent. less than solid, a fact which has prompted the very natural suggestion on the part of the compound plate makers that comparison with solid steel should be made on the basis of equal weight rather than equal thickness of plate.

Comparative results.

Weight per cubic foot of the steel plate.

Comparative weight per cubic foot of compound and solid steel plates.

Holtzer and Firmini have continued to supply projectiles, and the manufacture of good forged steel projectiles has been achieved by some of our English firms, who have submitted batches which have passed the service tests and been accepted. Among experimental projectiles, marked success was achieved by some 25-pound steel shells of Mr. Low, late manager to the Royal Laboratory, which were subjected to hydraulic pressure while red-hot. Some extraordinary projectiles of Whitworth's have been fired, one of which at first was declared to be not only not set up, but on the other hand, to be absolutely lengthened very slightly on impact. This cannot be, but the mistake could only be made with a shot which was not perceptibly

Steel projectiles.

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shortened. Notwithstanding the encouraging results that can be instanced, the progress in this direction needs to be greatly stimulated if a sufficient supply of steel projectiles is to be developed in England. Instead of a few extraordinary steel shells from Whitworths, we ought to have had at least 10,000 by this time.

Krupp projectiles and British steel-faced plates.

In the end of 1887, and in March 1888,* Krupp tested the powers of certain steel projectiles against steel-faced plates obtained from Messrs. Cammell. At the same time he also attacked a special curved shield of very hard steel of his own, 23·62 in. (60 cm.) thick, and a wrought-iron Cammell plate of the same dimensions as the steel-faced ones; namely, 11 ft. (335 cm.) long, 9 ft. (272 cm.) wide, and 15·55 in. (39·5 cm.) thick, on a backing of oak 7·87 in. (20 cm.) thick. The guns employed were 11·02 in. (28 cm.), and 9·45 (24 cm.) calibre. They fired forged-steel shells of about 545 lbs. and 213 lbs. weight, with striking velocities of about 1540 and 1765 ft. respectively. This implies a perforation through wrought-iron of about 19·3 inches, and steel of 15·5 inches for the 24-cm. projectile, and 16·5 inches of iron, or 13·3 inches of steel for the 28-cm. projectile. Thus, while the smaller gun was exactly matched to the steel-faced shield, the heavier gun had not a sufficient charge and velocity to be a match for it. Fig. 1, Pl. II., of Part III., shows the steel-faced plate after the first attack. A is the 28-cm. projectile fixed in the plate, B the hole made by the 24-cm. projectile which perforated, breaking up into three; as shown at C, which is the recovered shell assembled.

Guns employed.

Wrought-iron plate attacked obliquely.

The wrought-iron plate was attacked at an angle of .25° with the normal or direct line, when the 28-cm. projectile remained held in the plate; and the 24-cm. passed through, breaking up into many fragments.

Krupp's trials.

On March 3, 1888, Krupp fired at the same steel-faced plate with an 8·26-in. (21 cm.) gun with projectiles weighing about 304 lbs. (138 kg.), with 1807 ft. striking velocity, implying a power of perforation of 16·98 inches of iron, or 13·58 inches of steel, or steel-faced armour. Both these projectiles, though not theoretically a match for the target, passed entirely through, as shown in A and B in Fig. 2, Pl. III., of Part III., and were recovered almost uninjured, as shown at the foot of the target below their respective passage holes. While the projectiles employed on the first occasion appear to have been rather hard and brittle, those fired in March are excellent, and suggest the necessity for making plates harder, so as to stop shot even at the cost of considerable fracture of the plate. It should be noticed that

* For further details see *Engineer* of July 13, 1888.

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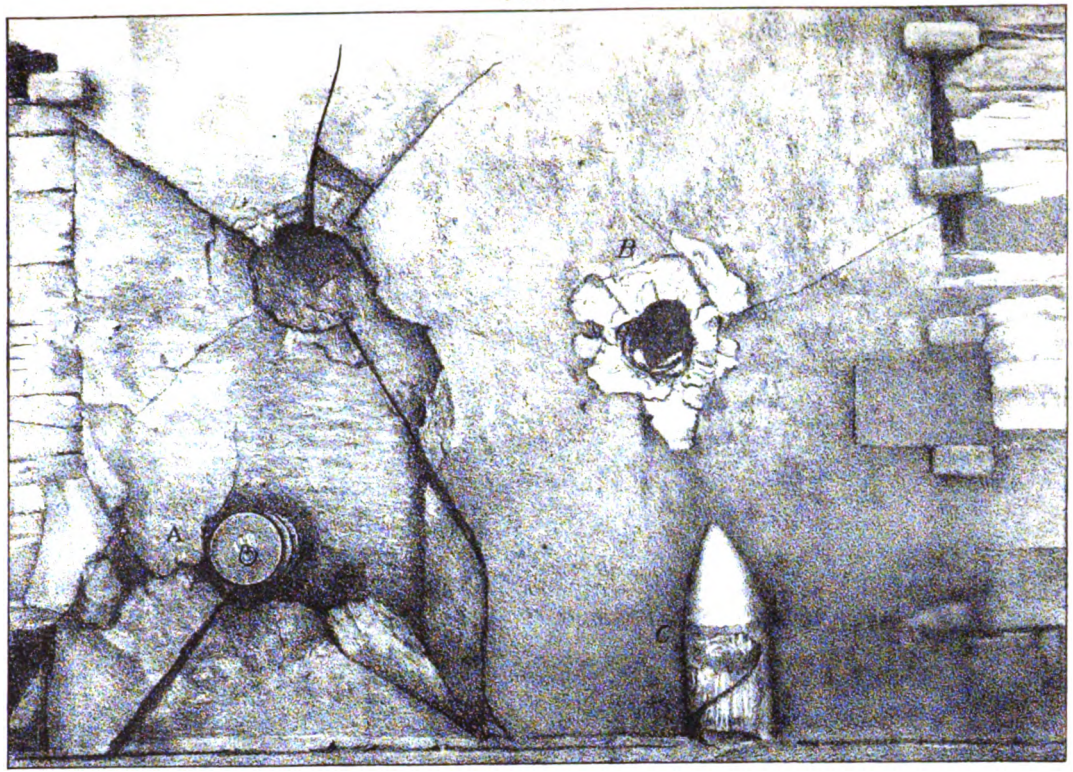
Fig. 1.



CAMMELL'S STEEL FACED PLATE, TESTED BY KRUPP IN 1887.

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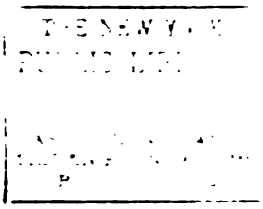

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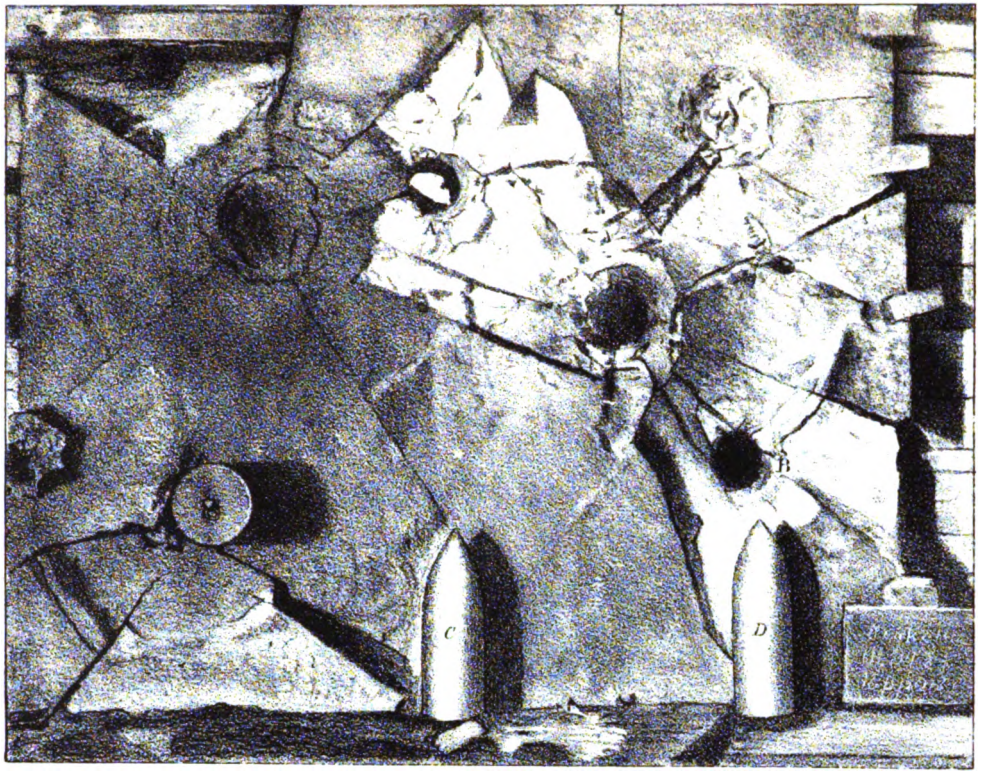
Fig. 2.



CAMMELL'S STEEL FACED PLATE FURTHER TESTED BY KRUPP IN MARCH 1888.

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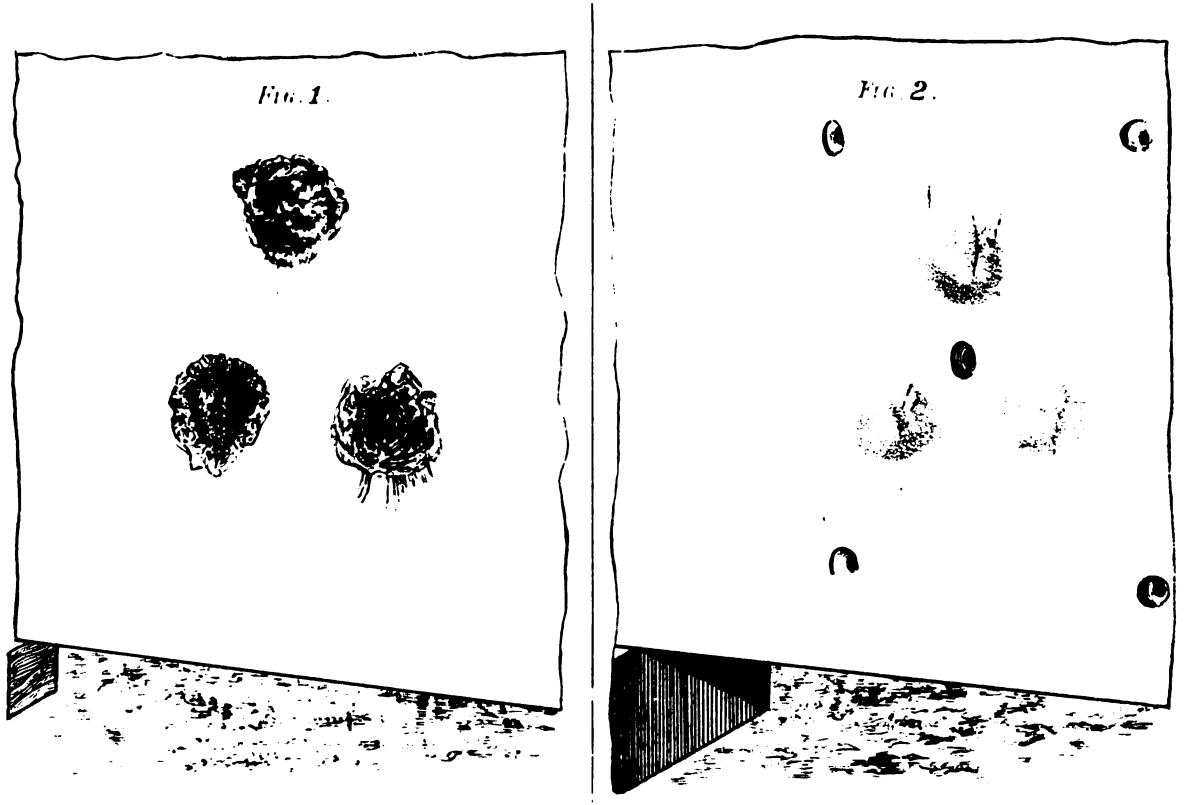

PLATES OF CAST STEEL, LEAD TEMPERED.
MADE BY THE SOCIÉTÉ DE CHATILLON ET COMMENTRY TESTED AT St JACQUES.

Pl IV.

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this plate appears to have behaved very well, and was apparently a very good one. It has held well together under heavy punishment; but the question arises whether it would not be better to sacrifice this power of holding together in order to keep the projectiles out. One ship's plate in action could hardly receive six blows on it, and it would surely be preferable that it should strip and break up more easily, in preference to allowing such projectiles, as are shown at C and D, Fig. 2, to pass into the interior of the ship, carrying perhaps blasting gelatine and exploding with horrible violence after their passage. Krupp's own hard steel plate, however, appears to have broken all to pieces at once, in fact to have gone much further than is desirable in the direction of hardness.

Lead tempering of steel.

The question of improving the quality of steel in armour, as well as in guns and projectiles by lead tempering, has received attention in France especially, during the past year. In England success has not hitherto attended experiments in this direction so far as is known.

The Société de Chatillon et Commentry has sufficiently perfected processes of lead-tempering to have turned out plates which have given good results at Gâvre and at St. Jacques, near Montluçon. The recommendation of the lead bath is that, owing to its conducting power and to the absence of vapour compared with water or oil, the metal is rendered more uniform in its condition, and cracks are avoided. Steel plates simply cast are said to be brought to the condition of forged metal by immersion in lead baths. Figs. 1 and 2, Pl. IV., of Part III., show the front and back of a plate of this nature, 4·72 in. (12 cm.) thick after 3 blows from chilled cast-iron projectiles 3·7 in. (95 mm.) in diameter, weighing 25·1 lbs. (11·4 kg.) with a striking velocity of 1410·8 ft. (430 m.) The points of impact are about 9·45 inches apart. The projectile was broken at each blow, and theoretically was slightly more than a match for an iron plate 4·72 inches thick, but the employment of chilled iron instead of steel, and the small size of the plate militate against the value of the experiment.

Diagrams and Rules as to Firing at Armour.

The following *rule of thumb* admits of proof on certain assumptions, and may be found useful.*

Rule of thumb.

Take the calibre of the gun as a measure of the armour, and it will be found that no shot can perforate a plate, unless it has over 1000 ft. velocity for each calibre in the thickness. Thus an 8-in. projectile must have over 1000 ft. striking velocity to perforate an 8-in.

* For more full directions, see *Annuals* for 1886, 1887.

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plate. It must have over 1500 ft. velocity for a 12-in. plate, over 2000 for a 16-in. plate, and so proportionally.

For many new-type guns firing projectiles heavy in proportion to their calibre, the direct perforation is very close to one calibre for every 1000 ft. striking velocity.

Rule of thumb for oblique fire.

In *oblique fire* the perforation is found by multiplying the direct perforation into the sine of the angle made by the axis of the shot with the face of the plate, unless this angle becomes too oblique for the shot to bite, which will generally be the case below 45°, even with armour below the power of the shot. At sea this calculation is seldom useful because the angle of incidence is seldom known,* so that the maximum effect possible (i.e. direct perforation) is more important. In a siege, however, oblique perforation might be required.

Old-type guns and a few new guns firing projectiles of large calibre in proportion to their weight have less penetration than that given by the above rule; while guns of the future with a calibre which is very small in proportion to their weight, may obtain greater perforation than given by the rule of thumb if fired under very favourable conditions.

Conclusion.

On the whole, then, it may be concluded that it is useless to fire at wrought-iron plates with less than 1000 ft. striking velocity for each calibre in the thickness of the plate attacked, further allowance being necessary with old type guns, in oblique fire, and also some allowance for backing.

Diagrams. General Inglis's.

For immediate use in connection with service guns, projectiles and charges, the late General Inglis prepared a diagram on which perforations can be read off at a glance. If the charge differs from that specified on the diagram, the perforation for any given velocity is correctly shown, but the range at which this is marked will no longer be correct.

General Maitland's.

General Maitland has a diagram which may be employed for any question of perforation of iron. It is less quickly used and less simple than that of General Inglis, but it is available for experimental and irregular conditions, it gives more information than any other, and in using it an actual process of calculation is mechanically performed, which is perhaps more perfect in theory than any other known in England.

Colonel Noble's.

The diagrams, Pls. V., VI., VII., and VIII., of Part III., are based on a series that owe their origin to the official one prepared by Colonel Noble in 1873, and are corrected up to date. Foreign ships

* A vessel attacking a fort might increase the resisting power of her side armour by maintaining an oblique position.

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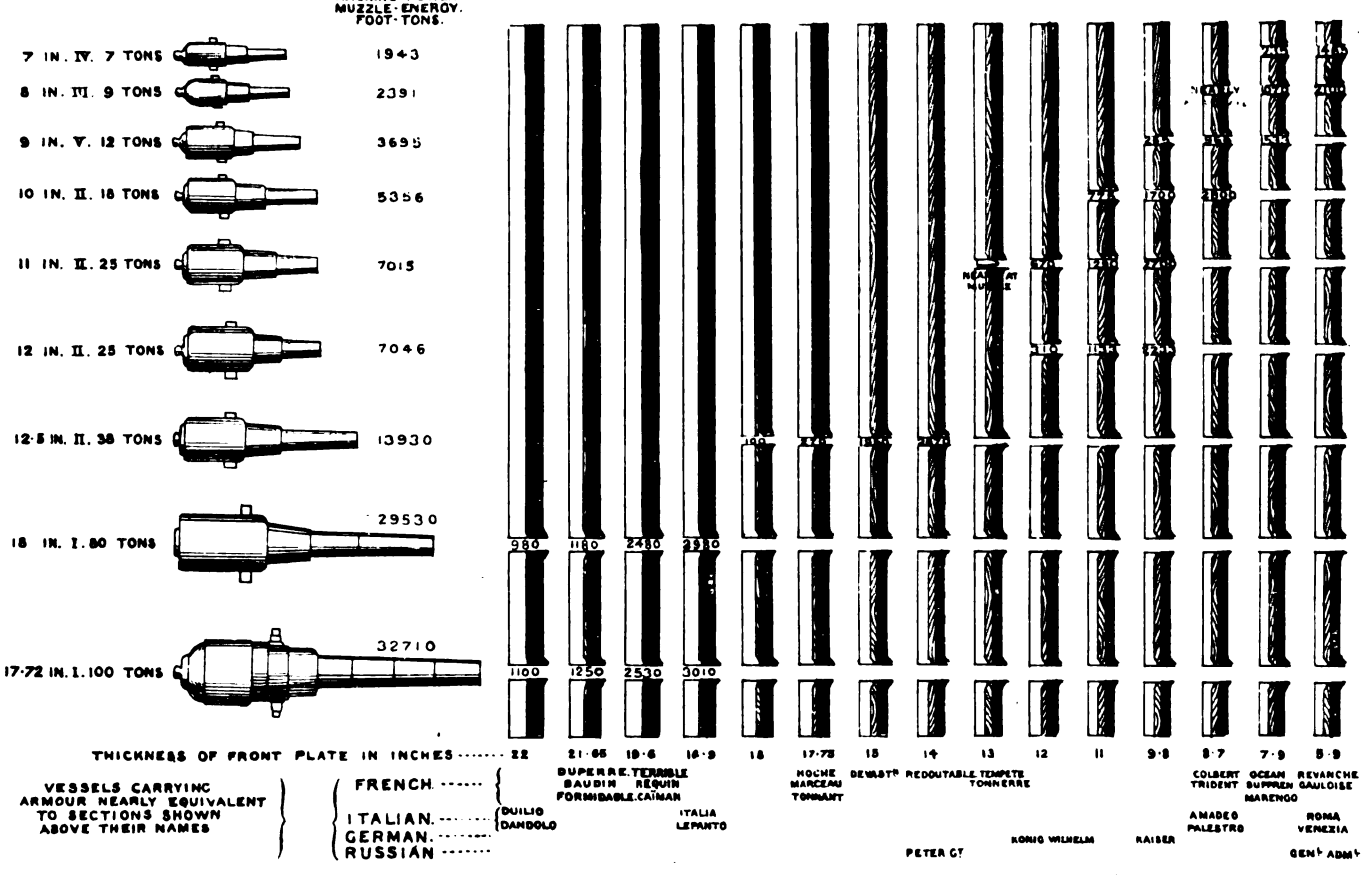

A HOLE WITHOUT FIGURES MEANS PERFORATION UP TO 3000 YARDS: MAXIMUM RANGES OF PERFORATION LESS THAN 3000 YARDS ARE MARKED IN FIGURES.

SCALE - 20 FEET TO AN INCH. SHADED GUNS ARE CORRECT IN GENERAL OUTLINE, DOTTED GUNS ONLY AS TO LENGTH.

ALL BACKING IS 18 IN. OF WOOD WITH 1½ IN. SKIN.

PL. V.

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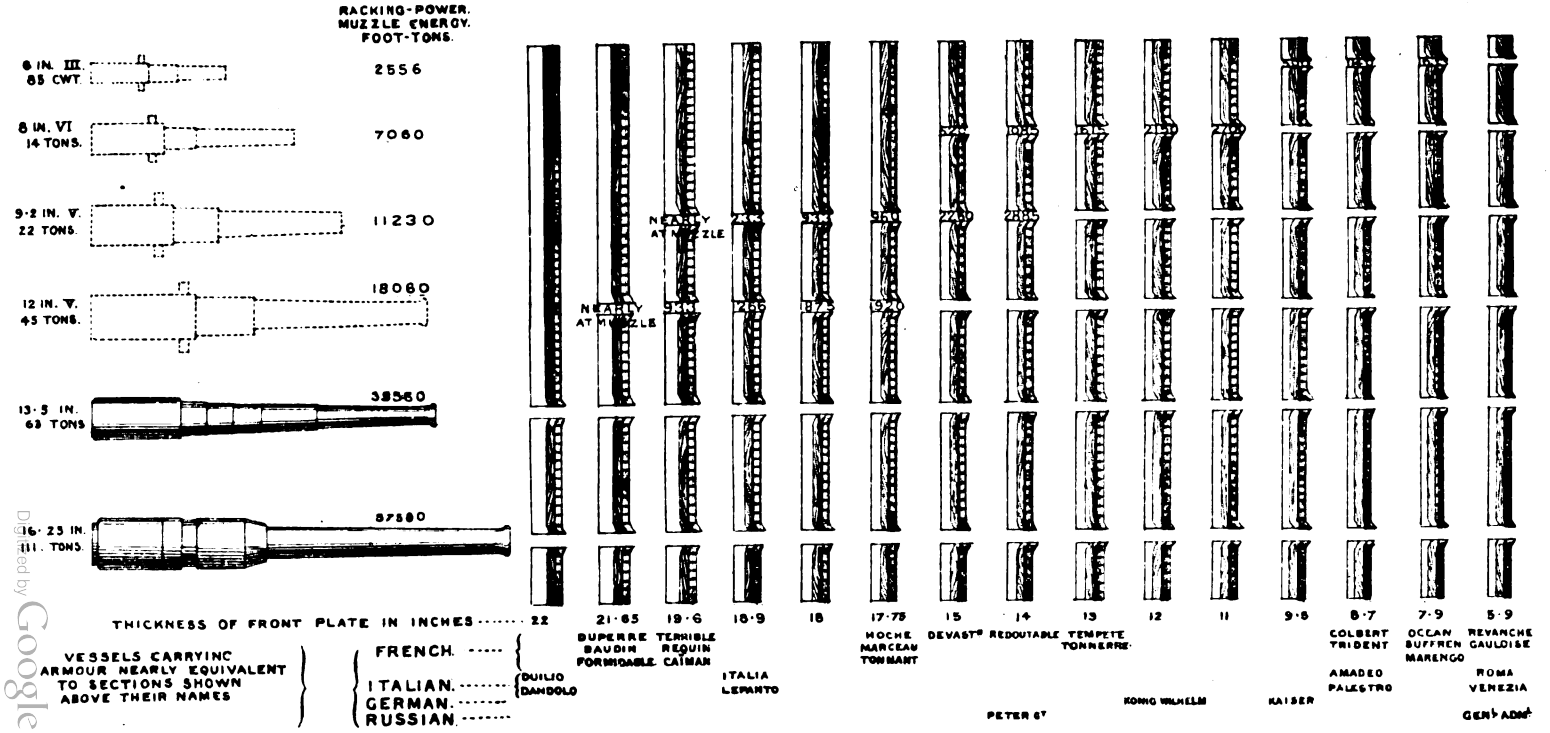
BRITISH B.L. GUNS.

PERFORATION.



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Pl. VI.

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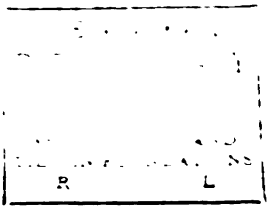

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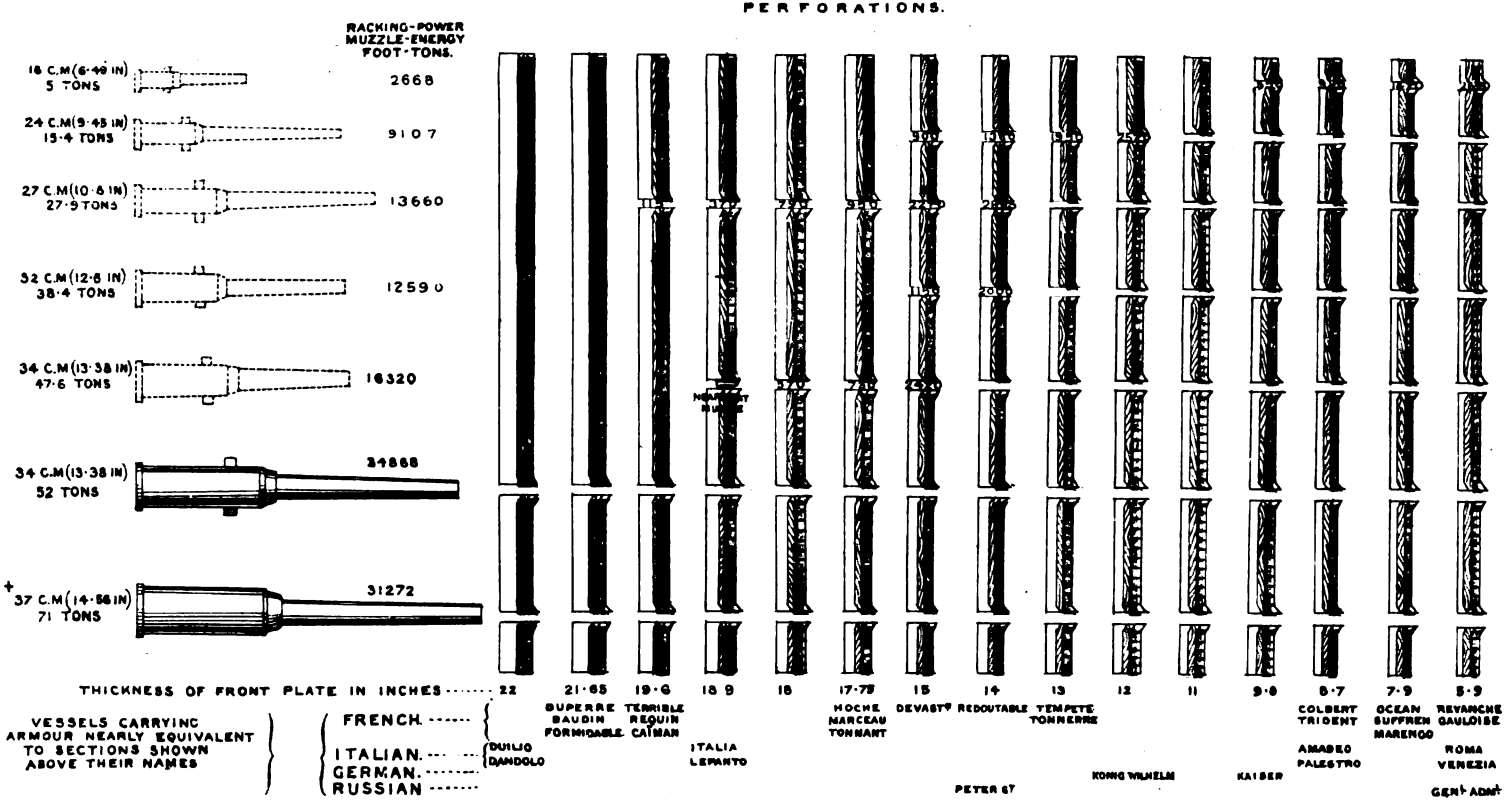
PERFORATIONS.
RACKING-POWER MUZZLE-ENERGY FOOT-TONS.
16 C.M (6·49 IN) 5 TONS
2668
24 C.M (9·45 IN) 15·4 TONS
9107
27 C.M (10·6 IN) 27·9 TONS
13660
32 C.M (12·6 IN) 38·4 TONS
12590
34 C.M (13·38 IN) 47·6 TONS
16320
34 C.M (13·38 IN) 52 TONS
24868
† 37 C.M (14·56 IN) 71 TONS
31272
THICKNESS OF FRONT PLATE IN INCHES ····· 22 21·65 19·6 18·9 18 17·72 15 14 13 12 11 9·8 8·7 7·9 5·9
VESSELS CARRYING ARMOUR NEARLY EQUIVALENT TO SECTIONS SHOWN ABOVE THEIR NAMES
FRENCH. ····· DUILIO DANDOLO SUPERBE BAUDIN FORMIDABLE TERRIBLE REQUIN CAÏMAN HOCHE MARCEAU TONNANT DEVASTº REDOUTABLE TEMPETE TONNERRE COLBERT TRIDENT OCEAN SUFFREN MARENGO REVANCHE GAULOISE
ITALIAN. ··· ITALIA LEPANTO AMMIRAGLIO PALESTRO ROMA VENEZIA
GERMAN. ····· KONIG WILHELM KAISER GENTADM
RUSSIAN ····· PETER GT

A HOLE WITHOUT FIGURES MEANS PERFORATION UP TO 3000 YARDS: MAXIMUM RANGES OF PERFORATION LESS THAN 3000 YARDS ARE MARKED IN FIGURES.

SCALE - 20 FEET TO AN INCH. SHADED GUNS ARE CORRECT IN GENERAL OUTLINE, DOTTED GUNS ONLY AS TO LENGTH.

ALL BACKING IS 18 IN. OF WOOD WITH 1½ IN. SKIN.

† A GUN OF 42 C.M. OF OLDER TYPE PATTERN 1875, WEIGHING 74·6 TONS IS SHOWN IN TABLE WITH MORE ENERGY THAN THE 37 C.M. GUN HERE DEPICTED, AND EQUAL PERFORATION SEE TABLE OF FRENCH NAVAL ORDNANCE.

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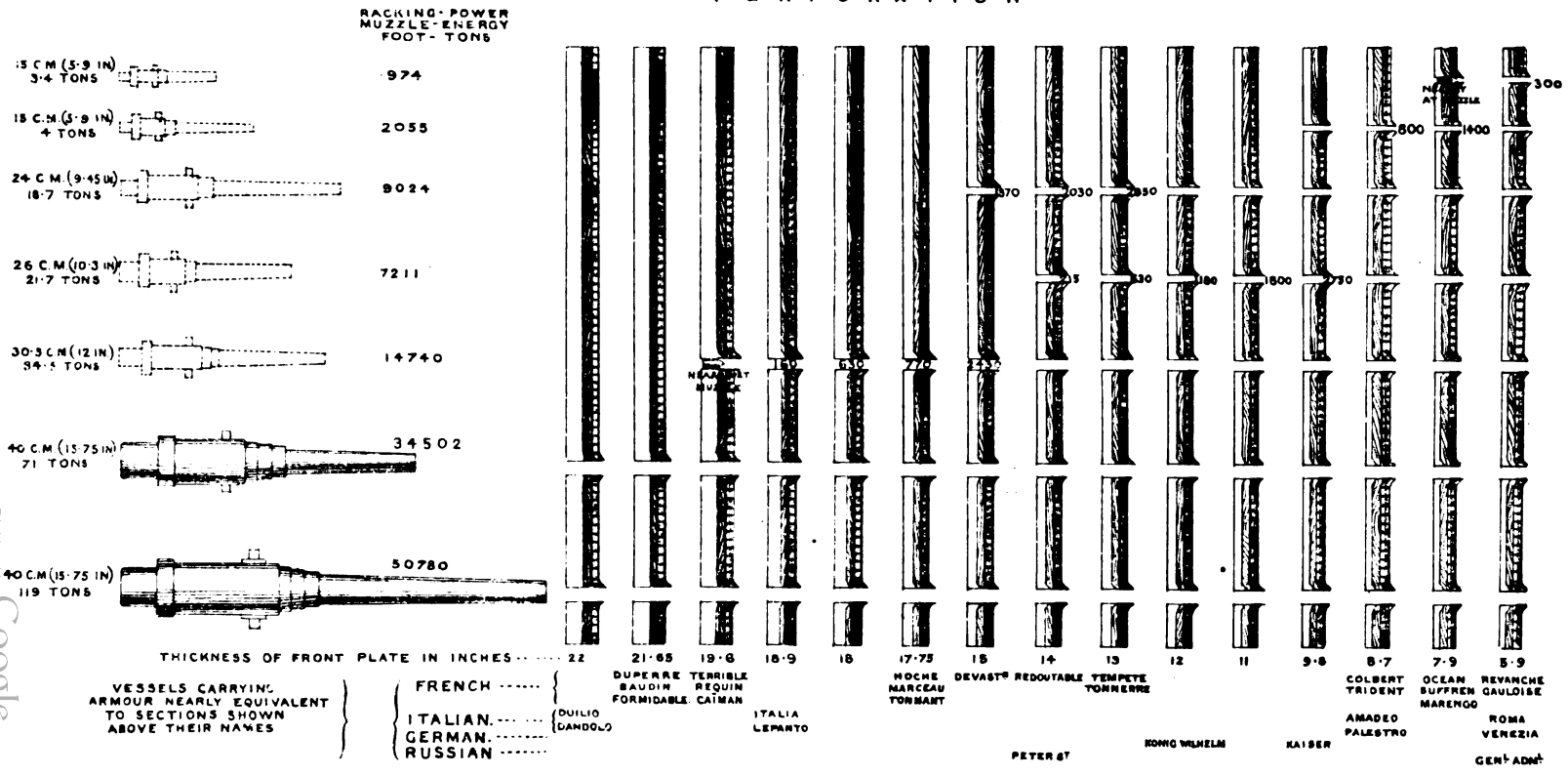
GERMAN GUNS

PERFORMANCE



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were given by Captain Grenfell, R.N., in *Engineering*, and have been shown for some years past in the Austrian *Marine Almanack* as well as in the *British Navy*. To give to these diagrams a definite practical character, the following course has been followed.

On the supposition that 3000 yards is the maximum range at which side armour will be systematically attacked, all projectiles perforating up to 3000 yards are shown with a clear blank hole. For every perforation effected only at shorter ranges, the limit of range is entered in or near the hole. Thus, any officer finding armour corresponding to that of his enemy with a blank hole opposite his gun on the diagram, may hope to perforate *with a direct hit* at least up to 3000 yards. Should he find a number less than 3000 yards entered, he must not expect to perforate beyond the range so entered.

The armour is wrought-iron. It is only approximately representative. The types are chiefly French. The perforation includes backing and skin.

General Maitland's diagram has been used for calculating loss of velocity at each range. On service each hit would have less power to perforate than is indicated on the diagrams, in proportion as it strikes more obliquely.

Practical value of the diagrams.

The diagrams must be regarded as only approximate. They may however be of practical value, for an officer may be able to see at a glance that some ship's armour is *well within the power of his guns* or *quite beyond them*, and behave accordingly.

All armour-clad vessels built prior to 1876, and many subsequently, are *iron*-plated. To these the above directions apply. The question may naturally be asked, why ships clad in steel and compound armour are treated as if only sheathed in the same thickness of wrought-iron. The reply is that the object is to furnish a low limit for guns available for attack. In experimental firing, steel and compound plates have often been attacked and have suffered when projectiles have been employed just capable of perforating wrought-iron of the thickness of the steel in question. The yielding is more or less by fracture, and is a gradual process; still it would not be right to fix the limit higher, and to say that guns capable of such effects were useless for attack of such armour. Moreover, no other limit could be taken, seeing that some very soft steel armour exists approaching wrought-iron in quality, though how closely it is impossible to say.

Thus it may be laid down that steel or steel-faced plates may be attacked by guns capable of perforating wrought-iron of the same

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Practical value of the diagrams.

The diagrams must be regarded as only approximate. They may however be of practical value, for an officer may be able to see at a glance that some ship's armour is *well within the power of his guns* or *quite beyond them*, and behave accordingly.

All armour-clad vessels built prior to 1876, and many subsequently, are *iron*-plated. To these the above directions apply. The question may naturally be asked, why ships clad in steel and compound armour are treated as if only sheathed in the same thickness of wrought-iron. The reply is that the object is to furnish a low limit for guns available for attack. In experimental firing, steel and compound plates have often been attacked and have suffered when projectiles have been employed just capable of perforating wrought-iron of the thickness of the steel in question. The yielding is more or less by fracture, and is a gradual process; still it would not be right to fix the limit higher, and to say that guns capable of such effects were useless for attack of such armour. Moreover, no other limit could be taken, seeing that some very soft steel armour exists approaching wrought-iron in quality, though how closely it is impossible to say.

Thus it may be laid down that steel or steel-faced plates may be attacked by guns capable of perforating wrought-iron of the same

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thickness as the plates in question. There will, however, be gradual destruction instead of perforation.

Hard Armour.

Hard armour, then, including chilled iron and the harder steel and compound plates, cannot be perforated, and must be broken up before the structure behind it can be injured materially. A single hit will seldom do more than injure the armour itself. The harder kinds of such armour will suffer more than wrought-iron from the continued fire of comparatively light guns. The smashing effect of a projectile on hard armour is probably in proportion to its *total energy*, irrespective of calibre.* It is difficult to apply any rule to the case of hard armour, but it is desirable as far as possible to concentrate and continue the fire about the same spot, and all guns are available for such work. Such an operation may seldom be feasible in engagements between ships.

Woodite.

A new material called "Woodite" (after its inventor Mrs. Wood) has been recently brought forward and highly commended at the April meetings of the Institution of Civil Engineers and Naval Architects in 1889, by both Sir Nathaniel Barnaby and Sir Edward Reed. It takes two principal forms: (1) Elastic Woodite, (2) Buoyant Woodite.

Two principal forms.

The former consists mainly of india-rubber, subject to special treatment. It is intended for use behind thin iron and steel, being built in in blocks.

Thus applied it was attacked by Nordenfelt 6-pr. and 3-pr. Q. F. guns. The blocks were 8 in. thick. The shot holes closed up so completely that it is stated that water with a head of 40 feet failed to find its way through, and a thickness of 4 in. is now recommended as sufficient by the makers. Buoyant Woodite appears to consist principally of cork, in some light form, chemically treated. It is intended for raft purposes in ship construction, specially as a filling for cellular structures in which water can only enter to the extent in which the Woodite is bodily removed by shell, torpedo, or ram attack. It is imperfectly developed at present; but it is said by the makers to weigh from 14 to 20 lbs. per cubic foot, to cost about £45 per ton, to be but little subject to ignition, chemical action, or decay, or to crumble when crushed or fractured so as to interfere with the working of pumps and to admit into its texture only 4 per cent. of water in twenty-four hours. No formal government trial has yet been made of its powers.

* How greatly the power of guns to "smash" hard armour may differ from their powers of perforation may be seen by the fact that the 10-inch old type, and 6-inch new type guns on board the Nettle have nearly equal perforation, while the former has double the energy or smashing power (*vide* Diagrams) of the latter.

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CHAPTER II.

The Supply of Guns.*

Naval guns. Design and manufacture.

The design and construction of a gun of high ballistic powers and the actual manufacture and issue of such pieces in the requisite number to meet the wants of our Navy, are both necessary to place our naval artillery in a state of efficiency. The two are complementary parts of one task, but they are so far distinct from one another, that it is quite possible to be successful in the first, and to fail in the second. That is to say, it is obviously possible to succeed in pushing the experimental branch of the work so far as to turn out a few guns achieving great results, while our vessels still remain armed with obsolete and powerless weapons. Indeed, it may happen that attention may be so much concentrated on experimental achievements, that success in this direction may actually prevent a backward state of matters as to supply being recognised. It seems desirable to lay stress on this fact in order to show that while the high standard proved by the record which was given in the *Annual* of 1887 of the achievements of new-type guns is maintained, a much less satisfactory state of matters has to be noticed this year with regard to the supply of guns to our ships. The ballistic powers of individual British guns are the highest on record. Two or three examples may be given.

The 111-ton gun.

The 111-ton gun has attained the muzzle energy of 57,630 foot-tons with the reasonable maximum pressure in the bore of 19·9 tons per square inch.

Krupp's 119-ton gun.

Krupp's 119-ton gun was reported to have attained 58,123 foot-tons, but the velocity and weight given in the same report,† namely 579 metres and 920 kg. make up an energy of only 50,780 foot-tons, which exactly accords with figures given of the result through American sources, and is probably correct. If so, the

* *List of Authorities.*—Cuts and descriptions taken from the *Engineer*. Facts are also taken from the U.S. official publication *Information from Abroad*. Facts and figures especially from *Lloyd's Register of Shipping*, also from Major White's paper in *R. A. Institution Proceedings*, and Captain Haig's paper in the *U.S. Institution Proceedings*, also Lord Armstrong's speech at Elswick, Sept. 26, 1888.

† *Revue d'Artillerie*, January 1887, p. 323.

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Elswick 111-ton gun, while the most powerful gun in the world, has an energy of nearly 519 foot-tons per ton of gun, against 427 for the Krupp 119-ton gun. Krupp is reported to be engaged in the manufacture of a gun weighing 139 tons. Designs for one weighing 156 tons are said to have been recently drawn up in the Royal Gun Factory at Woolwich. The 67-ton gun of the gun factory has 33,360 foot-tons energy, or 531 foot-tons per ton of gun, while General Maitland claims for his gun factory 9·2-inch wire 22-ton gun, by far the best result for its weight yet achieved by a heavy gun, namely, 667 foot-tons per ton of gun.* The 12-pounder of 7 cwt. has 724 foot-tons energy per ton. It may be noticed for comparison, that in the revised French table the 42-cm. (16·54 inch) gun of 74·6 tons is given as having a total muzzle energy of 36,040 foot-tons, or 483 tons per ton of gun, and the heavy 16-cm. (6·49 inch) gun of 5 tons has a total energy of 2668 foot-tons, or 534 foot-tons per ton of gun. Wire-bound guns on Longridge's principle are said to be on trial at Aboukoff in Russia.

Krupp's 139-ton gun.

Woolwich 156-ton gun.

Woolwich 9·2-inch gun.

Longridge's wire-bound guns.

The objection may naturally be urged that a high ballistic result may be obtained at the cost of a near approach to rupture, and that guns have latterly not yielded near the powder chamber where the maximum strain occurs, but much further forward where the pressure is less but the gun much weaker; consequently a low register of maximum pressure may be no guarantee that a gun is not unduly strained in its weakest part. Some new-type British guns have been ruptured; the suspicion then suggests itself that the high ballistic results obtained by them only imply that we have strained our guns more than the Germans and French. It is well to state the objection fairly, and to admit the difficulty in meeting it, because failures of guns abroad are kept from public knowledge, as far as possible. It is true that rupture of the inner tube or forward portion of a new-type gun has occurred in more than one instance in England, but in spite of the difficulty in obtaining reliable information, we have evidence that our neighbours have suffered similarly. The undue strain forward which is easily rectified arises from going too far in the direction of slow powder, a direction in which at one time it was supposed that it was impossible to go sufficiently far. With slow burning powder the charge is more than double that formerly employed. To its effects, when perfectly controlled, are due the increased power of our guns; but in the case of any mistake or irregularity, we have to reckon with a force of enormous power of

Slow-burning powder might be carried too far.

* See p. 383.

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doing mischief. Experience is necessary to guarantee us against occasional failures; happily these are not generally of a dangerous character.

Supply of guns.

The supply of our guns has been the subject to which public attention has been specially directed during the past year. The question has not been so much whether Krupp's guns or our own show a slight superiority or inferiority, but rather whether we have a sufficient armament to provide a trustworthy defence for the country. Circumstances have caused the work of supply of our guns to stand still at one time, and circumstances now make us appear to be more behindhand than is really the case. The explanation of this may be easily given. By 1878, both Armstrong and Krupp had succeeded in obtaining ballistic results far in excess of all previous achievements, by the use of slow powder burnt in long bores in such a way as to keep up the pressure against the shot, and discharge it with a very high velocity while the gun had been subjected to only a very moderate maximum pressure. In the investigation which led to this, Elswick, represented by Captain Andrew Noble, took the lead, but in 1879 Krupp carried out a programme of experiments at Meppen in the presence of officers representing nearly all the European powers, of so remarkable a character, and on so large a scale, that an impression was produced that told largely in favour of Essen, and England was not in a position to go forward quickly, because the increased length which was now necessary obviously called for breech-loading, and England had adopted muzzle-loaders. As explained by General Maitland in a paper given in the *Annual* of 1886, there were strong reasons which prompted our authorities to wait and endeavour to secure once for all the best system of breech-closing, and the best construction as well as the best proportion as to length. This, however far it might be successful, entailed a loss of time which has left England with much ground to make up now in order to bring her armaments up to date. In all countries it will be found that a considerable time elapses before any new gun finds its way into the national armaments, especially when the piece in question is of peculiar size and power. This is often only apparent on close examination of any published lists, but as the new-type English guns are breech-loaders, and those of old-type muzzle-loaders, it is generally assumed in England, not only that all M.L. guns shown in our armaments are obsolete; but further, that all the B.L. guns shown in foreign armaments are guns of new type. The first assumption is not always correct, if by an old-type gun we mean a gun of low ballistic power, and the latter assumption is totally wrong. As an illustration of

Results in 1878.

Assumptions in regard to types of guns not always accurate.

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the mistake which is made by viewing all breech-loading guns as new-type pieces, and therefore superior to English muzzle-loaders, Tables I. and III. of Part III. are given, showing English and Russian guns respectively. The English table is divided into two. The first portion deals with new-type breech-loading guns, and the second with old-type muzzle-loaders. The superiority of the former over the latter is two-fold. First, the projectile leaves the bore with more energy in proportion to the weight of the gun; secondly, owing to the calibre being smaller, the projectile meets with less resistance in penetration, and thus has a further advantage in attacking soft armour. The energy per ton of gun, however, is the measure employed by Krupp, and, on the whole, the safest measure to take of the success of a gun as an artillery machine. The English new-type guns have, on an average, about 500 foot-tons energy, and those of the old type only about 300 foot-tons per ton of gun. Now, anyone who turns to the Russian table, and observes that it consists wholly of breech-loading pieces, and therefore sets them down as the same class of gun, and comparable with our English breech-loaders of the same weight, would make a great mistake; for far from being all new-type guns, the average energy per ton of gun of the entire table is not only less than the figure of our new guns—that is, less than 500—but it is actually less than that of our old-type guns taken by themselves, that is less than 300 foot-tons per ton of gun.

Comparison—English and Russian guns.

It is desirable to enter thus into detail, in order to explain that foreign breech-loading guns shown in tables must not be assumed to be all up to date, many really corresponding to our old muzzle-loaders, and in this instance many being even inferior. About English ordnance, however, no such serious mistake can be made. The muzzle-loading guns may generally be regarded as of old type, and the breech-loading as new; a few exceptions, however, exist even in the Navy. For example, it may be seen that to treat the 80-ton muzzle-loading gun with 369 foot-tons per ton of gun, and 29,530 foot-tons muzzle energy as an old-type gun, in the sense of a *feeble gun*, would practically be trifling with the question. Muzzle-loading guns have, however, been objected to on the score that under machine and quick gun fire, it would be impossible to work them; but this is an entire mistake. The gun detachments in the turrets of the Inflexible are safe indeed compared with the gunners on board the Amiral Duperré, whose barbettes expose the men's heads and shoulders completely to machine gun fire, while the men working the broadside batteries, although protected from most machine guns, are more likely to suffer from quick fire guns and shrapnel than if they had no iron ship side

Muzzle-loading guns.

Comparative safety of gunners in turrets of Inflexible and barbettes of the A. Duperré.

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in front of them. In short, the power of the guns may practically be best judged by the stored-up energy of their projectiles, apart from all questions of pattern and system of loading.

Tables I., II., and III. of Part III., are given to enable a comparison to be made between the powers of the British, French, and Russian fleets. The information is obtained chiefly from Lloyd's latest tables, the Official List of our own guns with their ballistic powers, and the Austrian *Marine Almanack*. In a few instances where patterns are not plainly specified, an estimate has necessarily been made, such as in the case of our 24- and 21-ton B.L. guns, where a mean has been taken. With these few exceptions the results are calculated on reliable data and ought to be substantially correct.*

Each table is divided into separate columns for guns behind armour and those which are without protection. In the case of the British table, the old and new type guns are also divided, although, as above remarked, the fact that the 80-ton gun is included under the second category, itself shows that old-type guns must not be set down as necessarily deficient in power. In the bottom line of each table is given the total weight of metal of protected and unprotected guns, and the total muzzle energy of the armament is printed up the last column, as calculated by multiplying the actual energy of each gun by the number existing, and finally adding all the results together.

British and French guns compared.

If we endeavour to compare the British and French guns, it may be observed that taking the energy per ton of gun as the test of its efficiency, we find the British new-type guns figure is 500, that of the old-type guns is 300, as before noticed. If we unite these figures in the proportion of 41 to 53, which is nearly that of the total weight of metal of each class of guns, we obtain 387 as the general figure of energy per ton of gun. The French total figure corresponding to this is 398. The difference between 398 and 387, then, roughly represents the amount in which the French guns are better than ours ton for ton at the present moment. This is a bad feature, and we must exert ourselves to rectify it. If it could be shown that the French factories had specially devoted their powers to their naval wants, some excuse might be found in the fact that their total weight of metal is 9390·3 tons, whereas ours is 14,008·9 tons; but unfortunately our land guns are notoriously behindhand, and those of the French are far ahead of us, so the thought of the land service does not bring

* Since these tables were published in their first shape in the *Engineer* of June 1, 1888, they have been in a great measure re-worked and corrected, and the total energies have been calculated instead of arriving at them approximately by taking the mean energy per ton of gun and multiplying it by the total tonnage of the guns of each class.

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us any comfort. The fact is that we must now remember that we saved money while we waited, and kept it in our pockets, instead of turning it into guns, and we must not grudge now what is necessary to enable us to press on so as to avoid suffering the penalty of our repose.

British and French—Comparisons of gun power behind armour.

In the meantime it may be desirable to compare our own gun-power with that of France by means of Tables I. and II. of Part III. Take the armourclad fleets first. We have behind armour 9397 tons of ordnance, and the French 6927·6 tons.* The total energies are respectively 3,634,019·5 and 2,831,873 foot-tons; that is, the armoured artillery powers are nearly in the proportion of 9 to 7. If Russia's ironclads be added to those of France, we have to add for them 3163·4 tons more metal, and 890,563 foot-tons more energy, making for the combined French and Russian armoured fleets 10,091·0 tons of metal, and 3,722,438 foot-tons energy—*that is to say, the guns of the combined French and Russian armoured fleets are at the present moment more powerful than the British.*

Ditto if Russian armoured ships be added to those of France.

The fact that the combined French and Russian armoured fleets are thus superior to our own is serious enough. Guns, however, are not the only element in fighting. The resisting power of our armour must be considered as well as the innumerable qualities of the ships which cannot here be discussed. It may, however, be allowable to take a general estimate of all these powers possessed by the ships, by assuming that they are represented by the tonnage. That is to say, that increased tonnage means either heavier armour, more coals, more powerful engines, or some other advantage. This is only true approximately of ships constructed at about the same date, but the assumption may be made that in this respect the advantages are sufficiently nearly equal to admit of a comparison on the basis of total armoured tonnage. By Lloyd's List for 1888, this is for the British fleet—502,170, for the French 318,415, and for the Russian 161,680 tons. Thus the armoured tonnage of the combined French and Russian fleets is 480,095 tons. The British ships then thus possess a slight advantage. The energy of the gun fire may be applied to the opposite fleet by dividing the total energy by the number of tons displacement. Thus, if the 3,634,019·5 foot-tons energy of the British armoured guns be divided by 480,095 tons, which is the displacement of French and Russian combined fleets, the quotient obtained is 7·56 feet; meaning that our energy of fire, if applied in a suitable form, would be capable of lifting the combined

A further comparison.

* See Tables, pp. 376, 377.

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French and Russian fleets 7·56 feet. While, if their energy of fire, namely, 3,722,438 foot-tons, be divided by our fleet's tonnage, namely, 502,170 tons, the quotient is 7·41, implying that their fire is thus equivalent to lifting our fleet 7·41 feet. The British armoured fleet thus estimated is slightly superior, but with all the uncertain elements involved, the two may be said to be equal. It may be well next to consider the unarmoured fleets, among which are included the British and the French deck-protected ships. The weight of metal and energy of the British unarmoured guns are 4585·3 tons, and 1,784,538·4 foot-tons; of the French 2423·6 tons, and 808,339 foot-tons; and of the Russian 620·3 tons, and 143,503 foot-tons respectively. Thus, the French and Russian unprotected guns combined amount to 3043·9 tons metal, with a muzzle energy of 951,842. That is to say, the energy of the guns of the combined French and Russian unarmoured ships is not much in excess of half that of the British guns, but happily the fact has at last been recognized that it is sufficient to destroy our commerce, and with it to threaten our national existence unless adequate steps are taken to checkmate attacks in all parts of the world.

Unarmoured fleets compared—British and French and Russian.

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I.—Table of Guns Afloat in British Ships.

Breech-loading New-Type Guns.

Gun designated by weight.	Calibre.	Behind armour. No. of each class.	Behind armour. Total weight of guns of each class.	Behind armour. Calculating from the best available data for each gun, the total muzzle energy is 1,999,085·5 foot-tons.	Unprotected. No. of each class.	Unprotected. Total weight of guns of each class.	Unprotected. Calculating from the best available data for each gun, the total muzzle energy is 1,259,088·4 foot-tons.
Tons.	Inches.						
111	16·25	6	666		..	..	
68	13·5	16	1080		..	..	
45	12	16	712		..	..	
29	10	2	58		..	..	
22	9·2	18	396		..	..	
14	8	10	140		8	112	
Total of heavy guns.		68	3052				
5	6	194	970		358	1790	
2	5	24	48		297	594	
1·3	4	3	3·9		2	2·6	
0·65	4	24	15·6		69	44·85	
Total of all guns		313	4089·5	..	734	2543·45	..

Old-Type Guns, Breech-loading and Muzzle-loading.

B. L. 0·75	3·75	44	33		85	63·75	
M. L.							
80	16	4	320		..	..	
38	12·5	18	684		..	..	
35	12	6	210		..	..	
25	12	14	350		..	..	
25	11	6	150		..	..	
18	10	58	1044		21	378	
12	9	148	1776		12	144	
Total of heavy guns.		298	4567				
9	8	50	450		..	..	
6·5	7	44	286		36	234	
4·5	7	1	4·5		81	364·5	
3·2	..	..	..		268	857·6	
Total of all guns		393	5307·5	..	503	2041·85	..

Calculating from the best available data for each gun the total muzzle energy is 1,634,934·0 foot-tons.

Calculating from the best available data for each gun, the total muzzle energy is 525,450 foot-tons.

	Total weight. Tons.	Total energy. Foot-tons.
Protected guns of all classes ..	9397·0	3,634,019·5
Unprotected guns „ ..	4585·3	1,784,538·4
Grand total of guns	13,982·3	5,418,557·9

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II.—Table of Guns Afloat in French Ships.

Breech-loading Guns of all Types.

Gun designated by weight.	Calibre.	Behind armour.			Unprotected.		
		No. of each class.	Total weight of guns of each class.		No. in each class.	Total weight of guns of each class.	
Tons.	Inches.						
74·6	16·54	8	596·8	Calculating from the best available data for each gun, the total muzzle energy is 2,831,873 foot-tons.	..	..	Calculating from the best available data for each gun, the total muzzle energy is 808,339 foot-tons.
71·0	14·66	6	426·0		..	..	
51·9	13·38	14	726·6		..	..	
47·0	13·4	26	1222·0		..	..	
27·9	10·8	19	530·1		..	..	
27·4	10·8	1	27·4		..	..	
24·1	10·8	10	241·0		..	..	
22·8	10·8	46	1048·8		..	..	
15·4	9·45	86	1324·4		..	..	
Total of heavy guns.		216	6143·1				
7·8	7·64	20	156		17	132·6	
5	6·49	1	5		60	300	
2·56	5·46	230	588·8		695	1779·2	
2·0?	4·72	2	4·0		28	56	
1·18	3.94	24	28·3		81	95·6	
0·59	3·54	4	2·4		102	60·2	
Total of all guns		497	6927·6	..	983	2423·6	..

	Total weight. Tons.	Total energy. Foot-tons.
Protected guns	6927·6	2,831,873
Unprotected guns	2423·6	808,339
Grand total of guns ..	9351·2	3,640,212

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III.—Table of Guns Afloat in Russian Ships.

Guns of all Types.

Gun designated by weight.	Calibre.	Behind armour. No. in each class.	Behind armour. Total weight of guns of each class.	Calculating from the best available data, the total muzzle energy of the guns behind armour is 890,565 foot-tons.	Unprotected. No. of each class.	Unprotected. Total weight of guns of each class.	Crediting the guns with 300 foot-tons energy per ton of gun, the total muzzle energy of unprotected guns is 161,820 foot-tons.
Tons.	Inches.		Tons.				
50·5	12	20	1010		..	..	
39·9	12	6	239·4		..	..	
28·2	11	12	338·4		..	..	
15·0	9	30	450		2	30	
Total of heavy guns.		68	2037·8				
9·7	8	78	756·6		9	87·3	
4·1	6	90	369		104	426·4	
0·87	4·2	..	..		88	76·6	
Total of all guns		236	3163·4	..	203	620·3	..

	Total weight. Tons.	Total energy. Foot-tons.
Protected guns	3163·4	890,565
Unprotected guns	620·3	143,505
Grand total of guns ..	3783·7	1,034,070

The supply of guns.

The actual supply of ordnance is probably always more or less behind time. It is seldom that the exact measure in which results have fallen short of anticipation is as clearly exhibited as in the accompanying parliamentary return, to which will be seen appended notes by the War Office and Admiralty.

Parliamentary return.

Army and Navy Guns.—The following is the parliamentary return, just issued, showing the number, description, designer, place of manufacture, and actual cost of the rifled iron and steel guns supplied by the War Department to the naval and land service during the year

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1886–7 (in continuation of parliamentary return, 1887, giving the return up to 1885–86):—

No. issued.	Nature.		Actual cost. Each.	Actual cost. Total.	Service. Land.	Service. Naval.
	R. M. L.		£ s. d.	£ s. d.		
7	9-pr., 6 cwt. ..		84 19 5	594 16 2	..	7
16	7-pr., 200 lb. ..		45 7 0	725 11 1	..	16
3	2·5-in.*		107 11 6	322 14 8	3	..
5	64-pr., 71 cwt.† ..		73 19 0	‡369 14 10	5	..
9	6·6-in. howitzers ..		268 9 8	2,416 7 2	9	..
	B. L.					
1	13·5-in.		10,859 12 7	10,859 12 7	..	1
1	12-in. (E.) ..	I.	7,839 3 10	7,839 3 10	1	..
5		III.	7,299 18 10	36,499 14 2	..	5
2		IV.	6,301 1 11	12,602 3 10	..	2
3	9·2-in. ..	I.	2,588 3 0	7,764 9 0	..	3
4		IV.	4,183 2 10	16,732 11 3	4	..
4		V.	4,118 3 2	16,472 12 8	..	4
1	8-in. (E.) .	III.	1,904 15 8	1,904 15 8	..	1
2		III.	1,969 17 4	3,939 14 8	..	2
3		IV.	2,344 17 4	7,034 12 0	..	3
7	6-in. (E.) ..	III.	789 11 5	5,526 19 7	..	7
3		IV	969 7 5	2,908 2 2	3	..
50		IV.	998 3 8	49,909 4 3	..	§50
7		IV.	973 5 7	6,812 19 3	..	7
3	5-in. (E.) ..	II.	342 9 7	1,027 8 10	..	3
59		III.	478 8 5	28,226 15 7	..	59
1		III.	482 3 9	482 3 9	1	..
21		III.	618 0 2	12,978 3 3	..	21
45	4-in. ..	IV.	346 19 2	15,613 2 5	..	45
6	20-pr. ..	I.	286 8 8	1,718 11 10	6	..
58	12-pr. ..	I.	222 7 6	12,897 16 11	58	..
326	..		..	264,180 1 5	90	236
					326	

* Designed by Sir W. Armstrong and Co.
† Designed by Sir W. Palliser. Converted from smooth-bore cast iron guns, lined with wrought iron, and rifled.
‡ Cost of conversion only.
§ Parts of these guns machined by contract.

With the exception of those indicated, the guns were designed at Woolwich. Those manufactured at Elswick are indicated thus (E.); the remainder were manufactured at Woolwich.

Navy Guns.—The following return shows (1) the number of new breech-loading guns issued during the year 1887; (2) Number and names of ships waiting for guns; (3) Weight and calibre of such guns; (4) Name of manufacturer; (5) Dates by which guns were originally promised; (6) Dates by which guns are expected to be delivered.

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(1.) *Number of New Breech-loading Guns issued for Sea Service between 1st January, 1887, and 24th December, 1887.*

Nature.	Number.
16·25-in. 110 tons	2
13·5 „ 67 „	4
12 „ 45 „	2
9·2 „ 22 „	7
8 „ 15 „	15
6 „ 5 „	122
5 „ 38 cwt.	61
4 „ 22 „	25
Total	238

Ships waiting for their Guns.

Names.	No. of guns.	Weight and calibre of guns.	Where manufactured.	Dates by which guns were originally promised.	Dates expected to be delivered.
Collingwood	4	12-in., 45 tons	Whitworth	May, 1887	2 ready; 2 ready in a month.
Howe ..	4	13·5-in., 67 tons	R. Gun Fac.	Sept. 1887	1 issued; 1 by 30 June, 1888; 2 by 30 Sept., 1888.
Camperdown	4	13·5-in., 67 tons	R. Gun Fac.	No promise	31 Mar., 1889.
	6	6-in., 5 tons	R. Gun Fac.	Dec., 1887	*
Anson ..	4	13·5-in., 67 tons	Elswick	14 m. from passing of steel, should be complet'd by April 1888	1 by 30 Sept., 1888; 1 by 30 Nov., 1888; 1 by 31 Jan., 1889; 1 by 31 Mar., 1889.
	6	6-in., 89 cwt.	R. Gun Fac.	Sept., 1885	Completed in '86, and issued to other ships. Returned for chase hooping; now ready.
Undaunted	2	9·2-in., 22 tons	Elswick	July, 1886	Under inspection.
Australia	2	9·2-in., 22 „	1 Elswick 1 R. Gun Fac.	July, 1886 June, 1887	Under inspection. 31 May, 1888.
	10	6-in., 5 tons	R. Gun Fac.	Dec., 1887	Ready.
Narcissus	2	9·2-in., 22 tons	Whitworth	March, 1887	30 June, 1888.
	10	6-in., 5 tons	2 Whitworth 8 R. Gun Fac.	Aug., 1887 Dec., 1887	*
Galatea ..	2	9·2-in., 22 tons	1 Whitworth 1 R. Gun Fac.	March, 1887 June, 1887	31 Aug., 1888. 31 May, 1888.
	10	6-in., 5 tons	8 R. Gun Fac. 2 Whitworth	Dec., 1887 Aug., 1887	Nearly ready.
Immortalité	2	9·2-in., 22 tons	R. Gun Fac.	Sept., 1887	31 Aug., 1888.
	10	6-in., 89 cwt.	R. Gun Fac.	Sept., 1885	Completed in '86, and issued to other ships. Returned for chase hooping; now ready.

* Three nearly ready; Royal Gun Factory will deliver at rate of three per week.

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Notes of War Office.—(1) This return is based upon the original orders given for particular ships, excepting in regard to the smaller natures of guns which were ordered on a general programme of so many guns for so many ships. (2) In many instances the allotment or appropriation, as shown in the returns, has been varied, and the particular guns are now down for issue to other ships. (3) The promised dates of delivery are taken from the periodical progress returns rendered by the Royal Gun Factory, which also embrace the contract dates in respect of guns ordered from the trade. (4) The promises or estimated dates for delivery were in every case dependent on the passing of steel, which has in many instances been delayed owing to rejections. (5) The general programme of delivery has also been affected by alterations of designs, modification of tests, chase hooping, &c.

Notes by Admiralty.—Of the ships named five are actually ready to receive their guns—Collingwood, Howe, Camperdown, Anson, and Undaunted. With regard to the other ships named, in all probability, when they are ready to receive their guns, they will be delayed on account of their guns not being ready.

The state of matters here shown is undoubtedly unsatisfactory. To have the Collingwood, Howe, Camperdown, Anson, and Undaunted all waiting for the guns is sheer waste of strength. The four ships of the Admiral class stand useless for defence for an average period of 7¾ months, and this is a serious loss, seeing how rapidly ships become superseded and obsolete.

The necessity of a special course of inspection and tests for steel is the most tangible reason for the delay, but the difficulty must admit of being grappled with. Guns might be ordered earlier; the trade might be encouraged to make such guns as, with a reasonable provision, come within the power of ordinary manufacturing establishments, and trials with wire guns should be pushed on. Mr. Longridge maintains that such guns could be made in half the time and at half the price of those now in the service.* No doubt the heaviest ordnance demands special experience, and it is difficult to hurry their manufacture without serious risk. There ought, however, to be no physical impossibility in increasing the means for turning them out at the Royal Gun Factories and Elswick.†

* On March 18, a question was asked in the House about a Longridge wire gun, said to have been made at Aboukoff, which had fired 1500 rounds, which had been made in half the time and at two-thirds the price of those now in the service.

On March 14, Lord C. Beresford stated in the House that French guns over 9 inches in calibre cost £320 per ton; Krupp guns £240 per ton, and English guns, since 1885, only £200 per ton.

† Lord G. Hamilton's speech on the naval estimates and his answers to questions

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Bursting of one of 48-ton guns of the Amiral Duperré.

A 34-cm. (13·4-in.) gun, weighing 47·58 tons, burst badly on board the Amiral Duperré on Dec. 13, 1888, blowing out its breech and killing the six men who worked it. An article in *Le Génie Civil*, of which a translation may be found in the *Engineer* of Feb. 8th last, discusses this at length. The writer lays stress on the fact that this gun was one of the first which was made wholly of steel. The steel he thinks was faulty probably at the back of the tube. The gun is shown in tables of ordnance as having a charge of 117 kg. (257·9 lbs.) and a projectile of 925·9 lbs., with a muzzle velocity of 1595 feet and a total energy 16,320 foot-tons, or 343 foot-tons per ton of gun. This is rather a low result for a steel gun of this date, and bears out the idea of faulty steel, but it is always to be remembered that we all now depend on our large charges burning in a progressive scientific way, which is liable to be upset by unsuspected conditions, when in consequence a very great strain may be imposed on the gun. The charge used on this occasion was one of 138 kg. (303·24 lbs.) of slow brown prismatic powder, giving less pressure, if burnt as intended, than the service charge mentioned above. M. Weyl, in the second of two articles on this accident in *Le Yacht*, suggests that the powder had suffered change of character from overheating on service.

Watkin's position finder.

Though indirectly connected with naval gunnery, the introduction of Watkin's system of position finding and of harbour defence is too important to be passed over without notice. This system has been under trial confidentially for some years—special attention was drawn to the matter when this year the Government granted a sum of £25,000 to Major Watkin, R.A., for his invention. The details of the system are still kept secret, but a very good account of the general features will be found in an essay of Major White, R.A., on Coast Defence, published in the Proceedings of the Artillery Institution of July 1886, for which a gold medal was awarded. The guns of the forts to which the system is applied are directed by two posts of observation, generally on opposite flanks. In each battery is an electric dial showing the training and elevation ordered for the guns at any instant. One observer keeps a telescope directed on the ship to be fired at, following it continually.

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put to him on March 7, corrected considerably on March 14, 1889, when the dates of delivery were hastened, furnish information as to how far the expectations here held out as to dates of delivery of guns for the following ships are fulfilled. The Howe delivery now promised on the beginning of May (7 months late); the Camperdown, the end of March (as originally promised); Undaunted and Immortalité, during March; Australia and Narcissus, during March. The Victoria is to have her guns during March; the Sansparíel by the end of April; the Trafalgar and Galatea by the end of August; the Medea by May 1; the Medusa by May 15; the Magicienne, Melpomene, and future ships, so it is hoped, will receive their guns as soon as they are ready for them.

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This causes two arms to move automatically over a plan of the harbour indicating the elevation and training to be ordered for the associated guns to hit the ship. At the same time the ship's course and speed is so shown that its position a minute or two in advance may be easily predicted and the required figures telegraphed to the batteries. The whole operation including firing may be estimated at 30 seconds. Experience has shown that the gain by the system is about 4 to 1 in accuracy; that is to say, that instead of 20 per cent. of hits about 80 per cent. are secured. The gain in rapidity is 2 to 1, and the fact that smoke in no way interferes with the aiming gives a further gain, which is estimated at 2 to 1, and the fact that it is not necessary for the enemy to be visible opens a new field for the position of batteries. It follows that on this estimate one gun on the Watkin-system is worth sixteen as formerly fired. In addition to this, far fewer highly-trained men are required. The effect of a gun firing without any reference, or without giving notice to the detachment working it, is at first rather startling, but this is a small matter. Probably few naval officers would advocate the attack of batteries concealed from view and firing with effect sixteen times as great as hitherto. Ships, no doubt, will still engage shore batteries, but hardly the first class of land defences.

Doubtless our ships if called upon to engage any sea front whose equipment is up to date, would encounter guns fired on some system of position finding, but it is believed that none exists of so perfect a character as that above mentioned. General Wray, in a pamphlet entitled "John Bull and his Guns," urges that the adoption of the Watkin-system should enable us to furnish our coaling stations easily with sufficient guns for good defence.

General Wray.

On April 16th, 1888, was fired at Shoeburyness the first of a series of rounds intended to investigate the conditions attending firing at the very long ranges now attainable, and also to test our powers. The gun selected was a wire gun made under the direction of General Maitland in the Royal Gun Factories. The calibre is 9·2 inches. The weight of gun is 22 tons. That of the projectile is 380 lbs., which, fired with a charge of 270 lbs., has a muzzle velocity of 2360 feet per second. The elevation of the first round was 40°. The projectile fell at a range of about 21,000 yards, or nearly 12 miles. The maximum height attained was probably about 3 miles. For some distance it thus traversed air which is much less dense and offers considerably less resistance than that near the surface of the earth. Hence the range is greater than could otherwise be accounted for. The calculation of the range under these conditions is difficult.

The Shoeburyness "Jubilee Rounds."

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Estimated ranges were sent in by Professor Bashforth and several artillery officers. Those of Major Harman and Lieutenant Dodd were the highest and approached most nearly to the actual result, but both fell below 20,000 yards.

On July 12th at 43° elevation a range of 21,600 yards was attained, and on July 26th with 45° elevation, the range was 21,800 yards.

The Pneumatic Dynamite Gun.

Captain Haig's paper.

A few words on the pneumatic dynamite gun were given in the *Annual* for 1887. This has since attracted attention from the great development which has taken place in its powers. Captain Haig, R.E., read a paper on it at the U.S. Institution on January 27, 1888. Captain Haig dwelt on the standard of efficiency now attained by Lieut. Zalinski since 1884, when operations were commenced. The most notable experiment was conducted on September 20, 1887, with an 8-inch pneumatic dynamite gun, shown in Plate 9, Part III., firing at a condemned survey schooner, the Silliman (length 79 feet, beam 22 feet), which was anchored at 1864 yards range. One blank shell was fired for range. The first shell fell 27 yards short, and the second 8 yards short and failed to explode. The third contained 50 lbs. of blasting gelatine and 5 lbs. of dynamite, and was fired with about 600 lbs. pressure and 15° elevation. After 10½ seconds time of flight it struck the water close under the starboard quarter of the Silliman and exploded, throwing up water 150 feet. The schooner was much shaken, and her main mast fell. The fourth shell fell in nearly the same place and exploded, wrecking and breaking the vessel up except the bows, so that the two following shells had little left to destroy. A gun of 15-inch bore is under construction with a shell containing 600 lbs. of gelatine, which is equivalent to about 652 lbs. of dry gun-cotton. A ship is being built to carry three of these guns, their length is to be 55 feet. The opinion given on this gun is that it will be very destructive to vessels at anchor. Its attack is of the character of vertical fire. The time of flight is so great even in the 10½ seconds occupied in the short range of 1864 yards that a ship might move between 70 and 80 yards, and the opinion was expressed that a fragile tube 40 or 50 feet long would probably be destroyed by quick fire before closing to 2000 yards range. The idea of the weapon for a cruiser did not meet with favour, but for harbour defence the gun was admitted to possess unquestionable merits. Zalinski's shell which fired by the completion of an electric circuit on impact is very ingenious. Against any hard object circuit is completed by the flying

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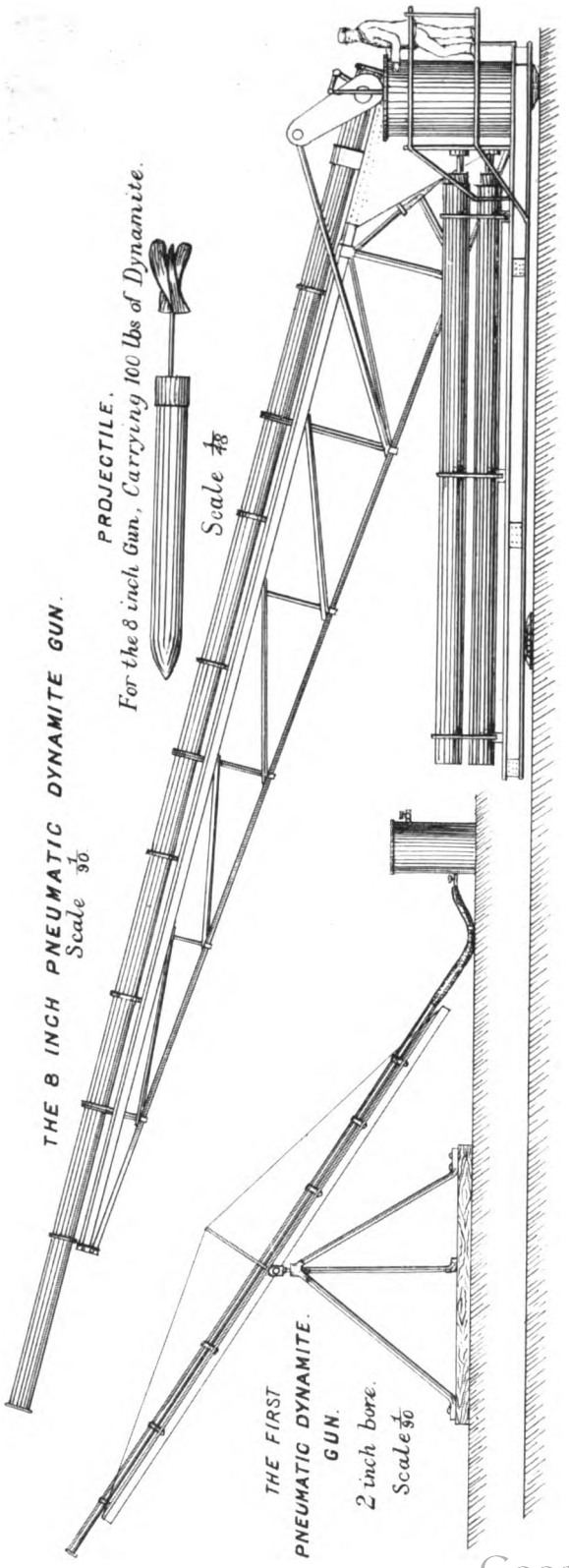

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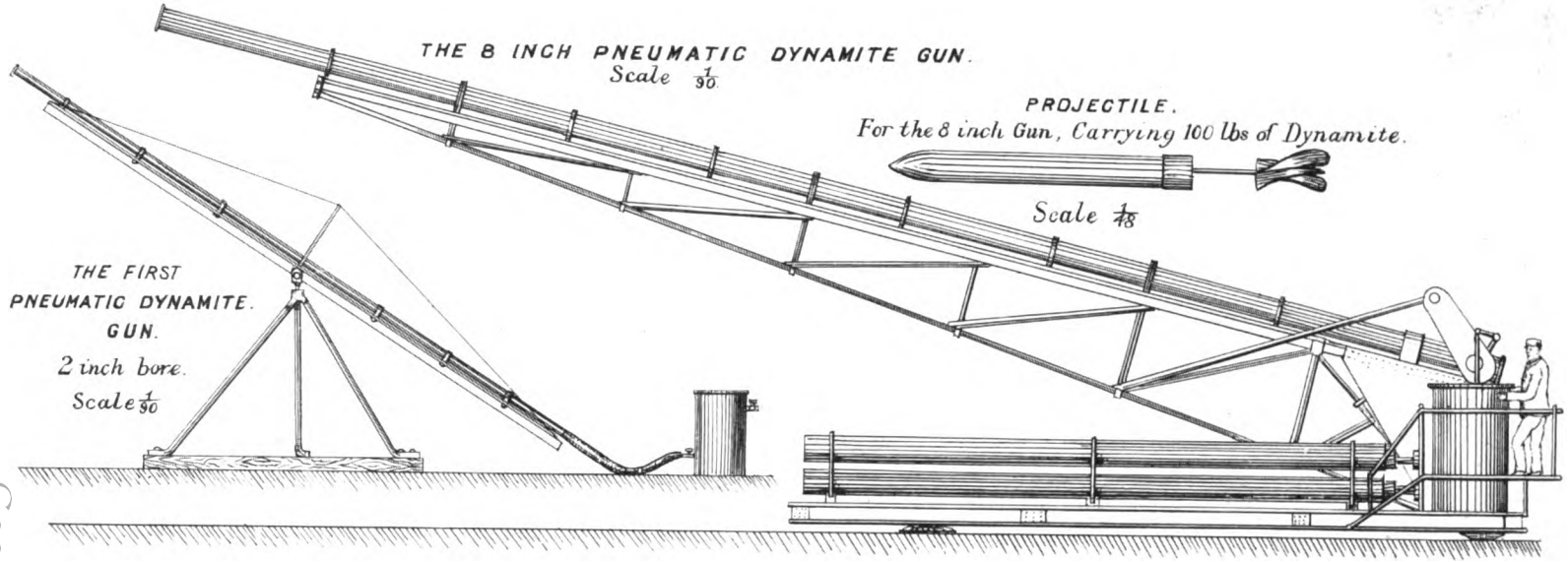

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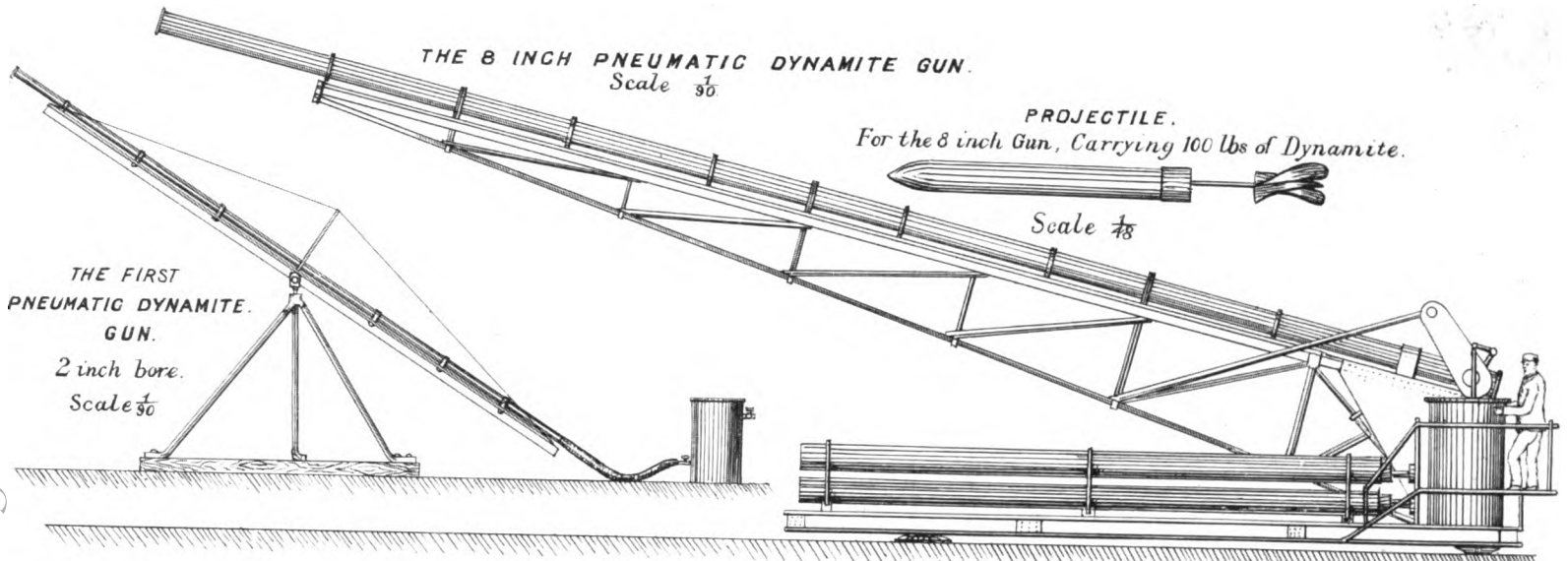

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forward of loose-fitting parts in the interior, and against the sea by the entrance of water. Rotation is imparted to the projectile by a tail 2 feet long with spiral feathers, vide Plate 9, of Part III. A very similar trial of a pneumatic gun is said to have taken place in Germany in the spring of 1888. J. W. Graydon, of the United States, has proposed a pneumatic gun, which he calls a "torpedo thrower," in which a much greater air pressure and velocity of projection is adopted than in the Zalinski gun. This enables a much shorter tube to be used, and presents considerable advantages. Graydon states that all danger of premature explosion of the high explosive employed is prevented by his system of charging the projectile, mentioned below, in explosive shells. At the same time it must be noticed that while the committee who tested his shells reported some measure of success, they also reported occasional failure. Graydon's pamphlets omit to notice this, but it may be seen in *Information from Abroad*, 1888, p. 377.

Graydon's torpedo thrower.

For some years it has been laid down that high explosives would be used for the bursting charges. Shells of forged steel resist the action of black powder, the use of which has been discontinued for armour-piercing projectiles. Experiments, however, were needed to enable a definite conclusion to be arrived at. It had been proved at Lydd some years since that Grüson's ingenious plan of filling shells with compounds which were only mixed and rendered explosive by the rotation of the projectile in flight, could be carried out without danger to the gun. More recently it has been shown that compounds such as Roburite, or Bellite, could probably be fired with safety, which would burst a shell with great violence. These two compounds resemble each other very closely. Bellite mainly consists of ammonium nitrate and di-nitro-benzole. Experiments made with both these compounds have shown an extraordinary power to resist ignition except by means of a detonator. Roburite has been fired in mines and explosive mixtures of gas to exhibit its close approach to entire absence of flame. Bellite has been mixed with powder in a mine, and the latter has been fired without igniting the Bellite. It has been crushed on iron plates by the fall of heavy weights, and has been melted in a coal fire without explosion.

Explosive shells.

Black powder.

Roburite, Bellite.

J. W. Graydon, of the United States, has also brought forward a compound for which he claims safety as an explosive for shells. He has also fired dynamite in shells subdivided in pellets with some measure of success, and high explosive bursting charges have also been fired in shells by Smolianinoff and Snyder. Steel common shells have a capacity in proportion to their weight which admits of a very large bursting charge. Still, as time went on, nothing was introduced

Other compounds.

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into the British service in the shape of a stronger explosive, probably for two reasons: One, that until steel shell could be made to perforate armour without setting up, it seemed hopeless to expect the explosive to remain intact under the heat and shock due to the process of penetration.* Armour has been growing harder and harder; the behaviour of the early forged steel shell was thought admirable because they perforated wrought iron without changing their form, but it has only been during the last three or four years that steel shell have resisted setting up on impact against steel-faced or solid steel armour, and even now it remains to be seen whether armour may not be given so hard a surface as to ensure the fracture or setting up of the projectile. Chilled iron armour never fails to break up the best projectiles. It may well be concluded that so intolerable a thing as a bursting shell must be kept out even at the cost of fracture of the armour to almost any extent. This conclusion is one especially opposed to the line taken by our own and foreign naval authorities, but this conclusion may be adopted eventually, if shells containing high explosives are successfully driven through the present types of armour so as to burst in the interior of the ship. A second way in which high explosive charges may act is by shattering the plates themselves on their impact with the exterior face, but this is of the two a less serious form of injury; and this leads to another branch of the question, on which some misapprehension appears to exist. It has been stated that the deck plates when they become visible, or open to be struck by shot, constitute a thinly-armoured target in the sense of a weak defence. This, no doubt, would be the case if it were not for the fact that the decks can be struck only at very oblique angles indeed. The principle governing the thickness of deck armour is that its resistance to shot glancing on it at 10° with the face shall be equal to the resistance of the side armour of the ship when struck directly. It follows then that a shot which strikes a deck at, say, 9° with the face, will have less power to penetrate than the same shot would have if it struck the vertical armour of the same ship directly; and if this is true of shot, another element exists in live shell, namely, the necessity for very quick explosion of the bursting charge. It was found at Meppen in 1882 that no fuse could be devised with quick enough action to cause a shell in curved fire to burst on the roof of a casemate before it glanced, and it was found that bursting after contact was past, a very insigni-

Armour.

Deck armour.

Meppen results.

* Recent trials have suggested that Bellite might do so. The Swedish Government have purchased a delay action fuze designed to adapt this explosive to the perforation of armour.

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ficant effect was produced. Against ships' decks at Eastney, common and Palliser shell were found occasionally to produce good effect, but it is a question whether Palliser shells were not more efficient than common shell, and it is quite clear that steel projectiles fitted with delay-action fuses for attacking vertical armour would not explode effectually on glancing on deck plates. Eastney deck-armour trials.

Altogether there is much to be worked out at Lydd, especially with regard to the effect of detonation against the surface of really thick armour. The value of experiments when thin plates are used and when penetration forms one element of the destructive action is comparatively little. France has taken the lead in the question of explosives. Whether Melinite is the best explosive may be questioned, but it is one of the best, and it is obviously far better to have learned how to use one of the best explosives efficiently, and to have secured a supply of it, than to be caught at the moment of war breaking out in an experimental stage of inquiry with two or three alternative compounds, with our minds not made up which to adopt; with but limited experience possessed by our chemists, none at all by our manufacturers and combatant officers, and no supply in store. Melinite.

To those who have the opportunity of studying the question of steel, more particularly as to its structure, two papers may be specially commended, one by William Metcalf in the Transactions of the American Society of Civil Engineers, and one by Captain Couhard of the French Artillery, in the *Revue d'Artillerie*. An excellent translation of the latter appeared in the Proceedings of the Royal Artillery Institution, and notices of both papers in the *Engineer* of April 6th, 1888. Structure of steel.

Mr. Longridge wrote an interesting paper on "Internal Ballistics," which was rejected by the Institution of Civil Engineers, and published by Messrs. Clowes & Sons, and reviewed in *Engineer* of February 3, 1888. This discussed the question of burning of powder in the bore, referring particularly to the results of investigations made by M. Sarrau in France. Mr. Longridge considers that our adoption of cocoa powder has been too precipitate. Longridge on Internal Ballistics.

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CHAPTER III.

QUICK-FIRING GUNS AND SMALL ARMS.*

Development of quick fire.

THE development of quick fire has made considerable progress during the year. Stress has been laid on the rapid destruction which may be effected of the unarmoured portions of ships of the Citadel and protected classes. On the other hand, it will become increasingly difficult for unarmoured vessels however small to approach armoured ships well supplied with quick-firing guns, and the old armoured vessels of the Minotaur class possess an unexpected advantage in their power of resisting quick fire from light guns. The smaller quick-firing pieces, namely, 6-pounders and 3-pounders, have been supplied to most ships, but larger ones, similar to those described in the *Annual* for 1887, although approved, are not yet issued for service. These will probably consist of a 36-pounder and a 6-in. gun. France and Russia have made trials with a 33-pounder of Hotchkiss construction. Krupp has made experiments with R. F. guns up to a 66-pounder.

Lord Armstrong on naval defence.

Lord Armstrong, on Sept. 26th last, spoke at a meeting of shareholders of Armstrong, Mitchell, & Co. on the work done recently, especially dwelling on the development of quick fire. Lord Armstrong said that the new Elswick 6-in. and 4¾-in. quick-fire guns, weighing 5 tons 15 cwt. and 2 tons 1 cwt., perforate 15 in. and 10·5 in. of wrought iron respectively at the muzzle. They are mounted on special carriages, provided with shields, and fitted with special gear for handling and aiming. He said that in Admiralty trials last year the 4¾-in. gun fired ten rounds in 47½ sec., while an ordinary breech-loading gun of the same calibre took 5 min. 7 sec. to fire the same number of rounds. At Shoeburyness a few weeks previously the power of these guns to pour in a rapid fire with accuracy was exhibited by a target 6 ft. square being hit five times running in 31 sec. at 1300 yards range. Lord Armstrong added that the Admiralty have adopted both these guns for the service. He dwelt on their value in resisting

* *List of Authorities.*—Captain Stone's paper in R. A. I. Proceedings; and Colonel Slade's pamphlet on Small Arms; also the *Times*, March 23, 1889.

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the attack of torpedo boats. A torpedo boat sighted at 1300 yards by a war vessel having a broadside armament of three ordinary 6-in. service guns would be open to their fire at the rate of about two rounds per minute until she came to within 200 yards, at which range she might probably discharge her torpedo. At the speed of 20 knots an hour she would traverse the 1300 yards of space between the range at which she was first seen and her striking range, in about two minutes. The three guns above mentioned might therefore fire twelve shots at her while running this distance; if, however, she had three rapid-fire 4¾-in. guns, she could fire seventy-two shots during the two minutes specified. For this quick fire to be delivered without obstruction, smoke must be got rid of as far as possible. Happily, a powder has now been made by the Chilworth Company which has so little smoke as to present little obstacle to the sighting of the gun. This powder, with a charge of about two-thirds the weight of the ordinary powder charge, gives a velocity of from 2300 ft. to 2400 ft. as compared with 2000 ft. due to the ordinary powder charge.

Applying the advantages of such guns to the case of protected cruisers, great results follow. In August last was launched for the Italian Government a cruiser named the Piemonte, which is a further improvement on the Esmeralda type; her displacement is only 2500 tons, yet her speed is to be 21 knots—or 24 miles—per hour, and the coal capacity of her bunkers is sufficient to steam about 13,000 miles at her most economical speed without re-coaling. Her offensive power is, he observed, enormous. "In addition to a complete torpedo equipment and full complement of Hotchkiss and Nordenfelt guns, she carries an armament of six 6-in. and six 4¾-in. guns of improved type; and she is capable of discharging against an adversary in a given time twice the weight of shot and shell that could be fired by the largest vessel now afloat, not excluding the leviathan battle ships of five or six times her size, which could ill withstand the torrent of shell which the Piemonte conld pour into the large unarmoured portion of their structure." Lord Armstrong points out with truth that the increased rapidity of the quick-fire gun offers the advantage of an increased number of guns without their increased weight of protecting shields and guns, or the increased number of men necessary to serve them; and he specially recommends the heavier quick-firing guns to be used in the defence of harbours, in conjunction with Major Watkin's system of position finding.

Piemonte.

The Maxim machine gun rifle bore was submitted for trial by our Government in March, 1887: it was not to exceed 100 lbs. in weight; it was to fire 400 rounds in one minute, 600 in two, and 1000 rounds

Maxim machine gun.

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in four minutes. Three guns submitted easily passed these tests, the last delivering 1000 rounds in a minute and a half. Having passed the sand and rust tests these guns were purchased. The following account of trials abroad is given by Capt. Stone, R.A., in a paper contributed to the Royal Artillery Institution Proceedings for April, 1888:—

Competitive trials against Maxim guns.

Four competitive trials took place on the Continent in 1887. In the first of these a Gardner gun, which had hitherto proved to be the best, was tried against the Maxim. The Gardner weighed 200 lbs. for the gun and 100 lb. for the stand, the Maxim gun 50 lb. with 60 lb. for the stand. The Gardner when worked by four men scored 300 rounds in sixty-one seconds, any faster work jamming the action. One man fired the Maxim 334 rounds in thirty-five seconds, with a greater number of hits. At 800 metres range the pieces were fired again. The Gardner fired 300 rounds in a minute, and the Maxim 334 rounds in thirty-four seconds; similar results following at 1300 metres range, except that the care necessary in aiming caused the fire of both guns to be slower. Two rows of dummies were then fired at. They were arranged twenty in a row with 20 metres distance between the rows. The Maxim was again victorious, killing thirty-five out of the forty dummies in three-quarters of a minute, so that the Committee reported in favour of the Maxim on all points.

At another trial the Maxim competed against the two-barrel Gardner and five-barrel Nordenfelt. The pieces were worked by one, four, and three men respectively. The Maxim fired 3000 rounds with no hitch, and stood a severe sand and rust test, the feed box and magazine being filled with sand. Fired for rapidity, the Maxim scored 400 rounds in 40 seconds, and 334 in 32 seconds. The Nordenfelt came next in order of speed, attaining 200 rounds in 23 seconds. Other experiments might be quoted. The Maxim exhibited the special advantages of allowing of its mechanism to be taken out, cleaned, and oiled by hand without instruments, and of accuracy in shooting, owing to a single barrel being employed instead of two or more whose axes cannot be perfectly parallel.

No gun which competed with the Maxim fired more than 1000 consecutive rounds; after that number had been discharged in the space of about four minutes, the barrels became too hot to continue firing at high speed. In the Maxim, over-heating is prevented by the water-jacket. It has been found that water begins to boil after 600 rounds have been fired, and subsequently nearly 1½ pints, or about 2 lbs. of water, are evaporated for every 1000 rounds. The water is in contact with the actual barrel for about two-thirds of its

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length, being automatically admitted from a small cistern into the barrel casing by the recoil of the barrel, and escaping as steam at the end of the tube near the muzzle of the gun.

Report of the trial of the Maxim gun in Italy.

From Captain Mariani's report on the trial of the Maxim gun in Italy the following facts are taken. The automatic character of the Maxim gun renders it necessary only to hold back the trigger "to continue the firing until all the cartridges in the belt are exhausted. In this way the single gunner who operates the arm can give all his attention to aiming, and he never need fire without having first well aimed, and can always fire at the instant of aiming." In other mitrailleuses the action of the man who aims is often subservient to that of the man who operates the gun, and *vice versâ*. Thus the marines found that it was not advisable to employ two men at the Gardner gun, one to aim and the other at the crank, yet only 240 rounds was the maximum number that could be fired in a minute if one man only were employed. This difficulty is most apparent in firing at a moving object. The Nordenfelt gun was fired 400 times in forty-one seconds, but only when the operating mechanic took a position which interfered with aiming the gun. The present form of the ten-barrelled Gatling has discharged 104 rounds in less than three seconds, but it is very difficult to change the aim, so that the stream of bullets falls on one point.

One merit in the Maxim system is "the fact that the gun ceases firing in the case of a misfire, so that jamming cannot take place till the gun is again worked, previous to which it should be examined carefully." It may be here noticed that the Maxim breech bolt containing nearly the entire mechanism of the arm can be removed and replaced, or carried off in case of threatened capture by an enemy. As to durability, the piece tried at Spezia fired 3200 rounds there, previous to which it had discharged 4000 rounds in Switzerland. It also fired 4000 at the Polygon of Cirie, making in all 11,200 rounds. As to accuracy, at 500 metres range two lines of targets 3 metres high and 24 metres wide were placed side by side. Out of 100 rounds fired on the right target there were 62 hits. Then 1000 were immediately fired on the left target, making 613 hits; and lastly 100 again on the right target, making 64 hits.

The belt which carries the cartridges takes some time charging; but it is easy to carry the rounds ready in belts. Objections have been made to the necessity for water in the jacket of the barrel; but from what has been already noticed as to the supply needed, it may be seen that the light weight of the Maxim more than makes up for the carriage of water.

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Austrian trials of the Maxim guns.

The Austrian Committee on the Maxim made a preliminary trial in July, 1887, with two rifle-calibre Maxim guns—11 mm.—and were satisfied as to rapidity of firing, simplicity, and ease of manipulation, and as to the power of one man to work the gun, and reported finally that of all the systems of Mitrailleuse hitherto tried, the Maxim is the best adapted to the purpose for which it is intended. The Maxim system has likewise undergone an exhaustive trial in France, and one gun has fired 20,000 rounds without any hitch or mishap. The trial in the United States was likewise successful, but details have not yet come to hand.

The illustrations tell their own tale to a great extent. Fig. 1, Plate 10 of Part III., is chiefly given to show the supply of cartridges on bands, joined so as to form a continuous stream. Fig. 2 shows plate wheels used as shields. Fig. 4, Plate 11 of Part III., shows a gun mounted on a tripod which only weighs 19 lb. and folds up. The weight of the gun and tripod is 70 lb. Fig. 3 shows a 1-pounder automatic gun on a mounting suitable for fortress or board ship fighting; a 3-pounder has now been made on the same principle. The gun has also been mounted on a cycle carriage, for the use of the cyclist corps recently formed, and seems likely to be of good service in this somewhat original capacity. On March 22nd, 1889, the Maxim Nordenfelt Company carried out a programme of experiments at Dartford, in which were exhibited a Maxim small-arm bore Mitrailleuse which fired 334 rounds in 27 seconds, also a completely automatic quick-firing gun of 37 mm. (1·46 inch) bore for meeting torpedo attack, which fired 340 rounds in a minute; a 14-pounder, and a horse-artillery quick-fire gun were also exhibited, and the value of Maxim's smokeless powder illustrated.

The Magazine Arm question.

No magazine arm has yet been adopted for the service, but this decision may very shortly be expected. The most authoritative information on the subject is that in a paper written by Colonel Slade of the Rifle Brigade, which has been reviewed in most of the daily papers, and from this the following information is obtained:—

Austria.

Continental powers have adopted magazine rifles whose characteristics are briefly given as follows:—Austria in 1886 adopted the Mannlicher, with a 0·433-in. bore, with a fixed magazine containing five rounds. This has subsequently been replaced by one of 0·315-in.

Belgium.

bore. Belgium in 1887 adopted a magazine arm with 0·315-in. bore with three grooves, having a detachable magazine firing a steel-covered bullet weighing 240 grains, with a charge of 57 grains of Rotweil

Denmark.

powder. Denmark has experimented since 1883 with the American

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FIG. 1.

FIG 2.

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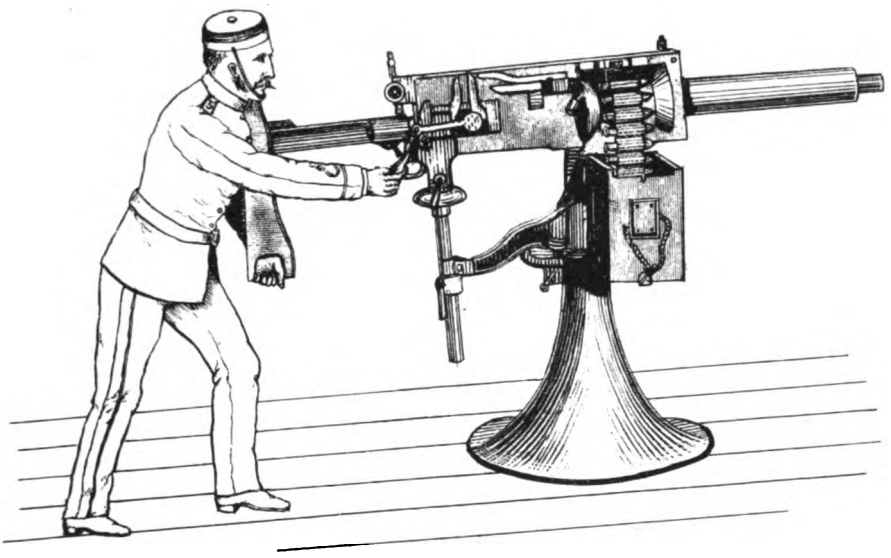
FIG. 3.



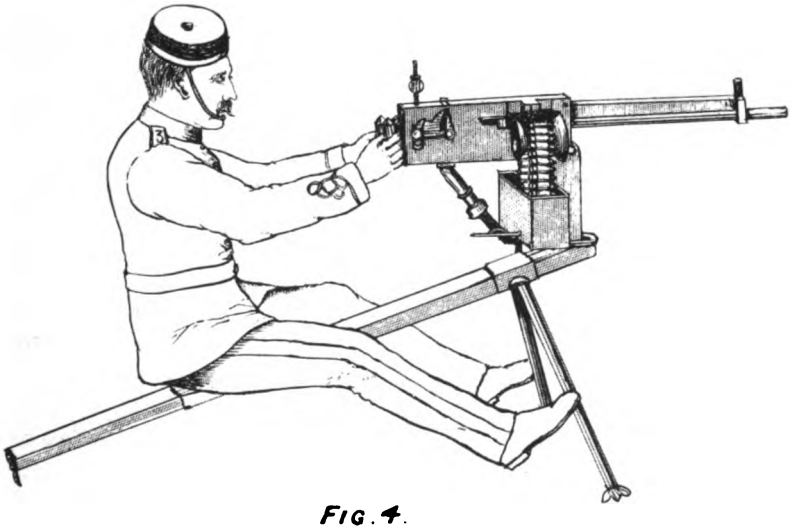


FIG. 4.

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Lee magazine arm of 0·315-in. bore, but is not reported to have definitely adopted it yet. France comes next in the alphabetical order observed by Colonel Slade; as it is the most important at the present moment, for more than one reason it may be best considered last. Germany had as the service arm the Mauser single breech-loader. She appears to have adopted experimentally the Lee with detachable magazine and bore of 0·295 in., fired with a muzzle velocity of from 1900 ft. to 2000 ft. by means of a charge of 40 grains of Duttenhofer's semi-smokeless powder. Italy first adopted the Vetterli of 0·408-in. bore, with a magazine fixed above the action containing ten cartridges, the rifle weighing 8 lb. 8 oz. It is believed that a small bore will replace this arm. Norway and Sweden have not decided. Portugal adopted a magazine rifle with a bore of 0·315 in., but is likely to come to the Kropatschek magazine arm of 0·315-in. bore, with a copper-covered hardened bullet weighing 246 grains, and a charge of Rotweil powder. Spain and Russia remain at present undecided; the latter manifests reluctance to adopt the small bore which is coming in everywhere. Switzerland, in spite of the lamentations expressed by Captain Stüder, has, by adopting repeating rifles before other nations, acquired most experience with them. Her arm is the Vetterli, with a bore of 0·409, with a magazine beneath the chamber containing ten cartridges. She suffers in the opposite way to England—that is to say, she pays the price of her forward position by having an arm which has been shown to be inferior to those which have subsequently come in. Turkey has a converted Mauser.

France. Germany. Italy. Norway and Sweden. Portugal. Russia and Spain. Switzerland. Turkey.

France first adopted the Kropatschek and Gras magazine arms, but has subsequently replaced them by the Gras-Lebel, weighing 8 lb. 10 oz., of which 350,000 are already issued—or, according to the *St. James's Gazette*, 580,000 rifles and 1,400,000,000 cartridges. This has a magazine underneath the arm containing nine rounds. The bore is 0·314 in. The bullet weighs 231·48 grains; it is of hardened lead, coated with nickel, and is fired with a muzzle velocity of 2200 ft. per second. The charge is composed of a slow-burning mixture of gun-cotton and collodion. This arm, like nearly all now adopted, has a bolt action. The barrel is 29·33 in. long, it has four grooves, each 0·15 mm. deep, and the twist is from right to left. The bayonet has a straight grooved blade of quadrangular section, and is 20·47 in. long. The rifle is sighted up to 2187 yards (2000 metres). At 220 yards the bullet is said to be capable of perforating 15 in. of oak. The most stringent precautions have been taken to keep secret the composition of the charge. Cartridges have been forbidden to be

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opened on penalty of imprisonment and hard labour for ten years. In spite of this, however, the secret has become known; Germany has experimented with copies of this mixture of gun-cotton and collodion, and it may be presumed that there can hardly be a compound of gun-cotton that Sir F. Abel does not know. This one can only differ in degree from the forms of gun-cotton rifle cartridges made by Sir F. Abel, and tried by us about 1870, which were objected to partly on account of uncertainty in action, and partly on account of failure in keeping qualities, which are much more severely taxed in the British service than in any other. We kept a magazine at a very high temperature for about a year, when it blew up. This was followed some time afterwards by the Stowmarket explosion in 1872, which damaged the reputation of dry gun-cotton.

It is said that it was intended to keep the construction of the Lebel magazine rifle secret, but the following description appeared in the *Engineer* of September 28th last. There are slight discrepancies* between this and Colonel Slade's statements: it is better to give both than to endeavour to reconcile them without the necessary means of correction:—

The Minister of War has published a sufficient description of the weapon in "*Instructions sur l'armement de l'infantrie.*" For this he has been seriously taken to task by many of the French journals, who have denounced the publication as a serious mistake. Figs. 1, 2, 3, and 4, Plate 12, of Part III., herewith, make its construction perfectly clear. It will be seen that it is really a modification of the Gras rifle of 1885, which in its turn was a modified Kropatschek, in use in the French Navy since 1878. The principal modification is in the calibre, which has been reduced from 0·472 in. to 0·315 in. The diminished weight of the weapon and its ammunition is a matter of very great importance, while the new powder employed renders, it is claimed, the small bore bullet as efficient as the large bore was with ordinary powder. A further improvement has been effected in the block which takes the force of recoil, which now works on two tenons, instead of as hitherto being supported on one side only.

The magazine is parallel with the barrel. In it the cartridges are placed end to end. A spring with a button on the end forces the cartridges toward the rear into a species of spoon A, by which the cartridge is raised into such a position that it is readily thrust forward into the chamber by the action of the sliding breech-block C P. A detent G prevents the next cartridge from finding its way under the

* The U. S. Intelligence Department appears to be in exactly the same doubt between alternative statements as to the Lebel rifle.

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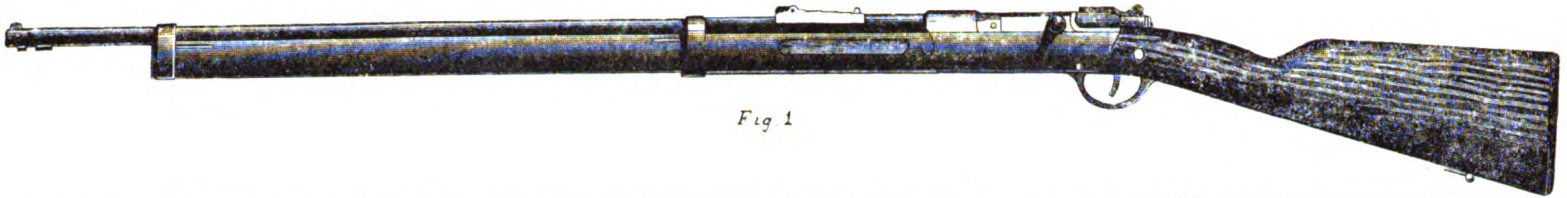

Fig. 1

Fig 2

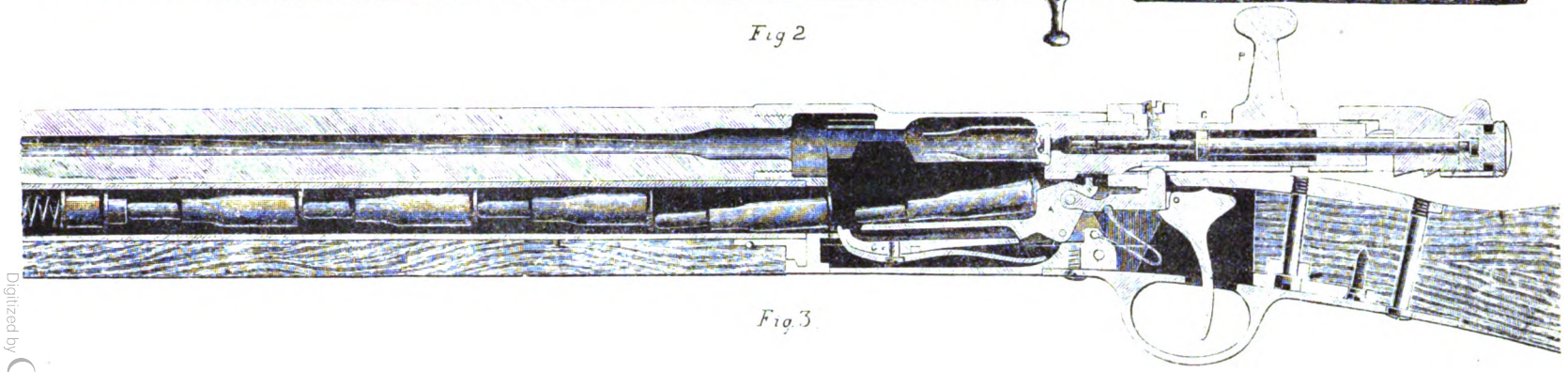

Fig. 3

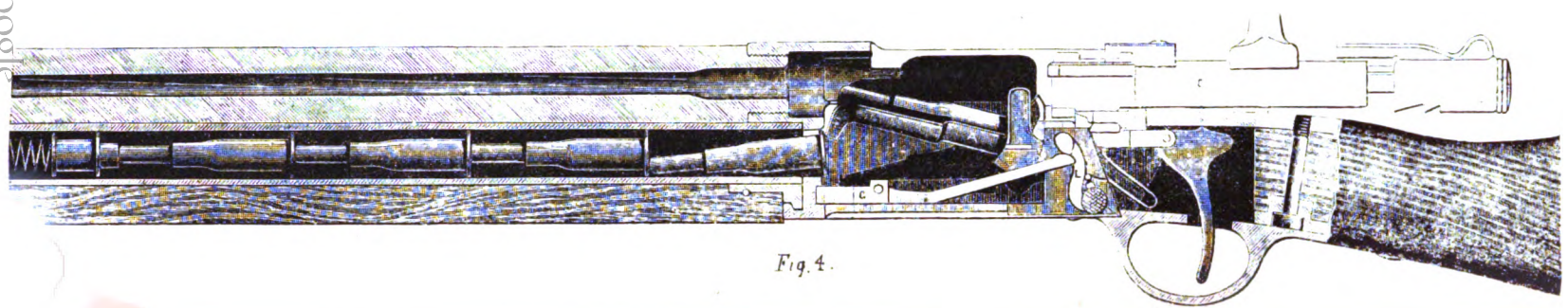

Fig. 4.

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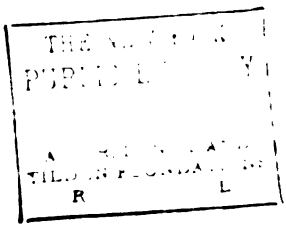

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spoon. By means of the thumb button L the repeating mechanism can be locked, and the rifle can then be fired as an ordinary breech-loader.

In our engravings Fig. 1 is an elevation showing the rifle with the breech closed ready for firing. Fig. 2 is a top view. Fig. 3 shows the rifle in section with the breech-block open; an empty cartridge is still in the jaws of the extractor ready to be thrown out at the top. In Fig. 4 the cartridge has been ejected, and the spoon contains a cartridge ready to be pushed into the chamber by the act of closing the breech. The locking and percussion mechanism are identical with those of the Gras rifle.

The new weapon measures over all, with its sword bayonet, 4 ft. $3\frac{3}{4}$ in., and weighs $9\frac{3}{4}$ lbs. with eight cartridges in the magazine.

England in 1885 decided on a bore of 0·402 in. and in August, 1885, decided to adopt a magazine arm. Three arms only stood the series of tests carried out, namely, the Owen Jones, the American Lee, and the so-called Improved Lee. Eventually, after trials on the questions of (1) strength, (2) non-liability to get out of order, (3) good extraction, (4) low trajectory, (5) ease of manufacture and repair, the American Lee was condemned on account of its magazine not being capable of being charged when fixed on the rifle; and the Owen Jones on the ground of being too complicated. The improved Lee had its magazine attached by screwing on, and was made to fill from above, and eventually was preferred to the Lee Burton. This arm now on trial is termed the Enfield Lee, and has a calibre of 0·303 in., rifled on the Metford system, with a magazine which is filled when on, but is detachable at will, containing eight rounds. One magazine is attached to the arm by a chain—any subsequently used might be thrown away when empty; 80,000 of these arms have been ordered. The muzzle velocity is said to be 1850 ft., and its trajectory is sufficiently flat to enable its fixed sight to be used up to 470 yards; a chemical compound may replace the powder charge, which will probably give a muzzle velocity of 2000 ft.; 115 rounds of its ammunition amount to the same weight as 70 rounds of the Martini-Henry.

The question is in a state too much resembling the condition in which that of the heavy guns long remained. Continental nations have feared to stand still while their neighbours were arming and learning experience with a weapon whose superiority was sufficiently formidable to constitute a danger. Hence the story of the heavy guns was repeated. The most important Continental Powers limited their time of investigation, and adopted arms which a limited inquiry recommended. England waits for exhaustive trial, hoping to secure

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the best arm, but paying for such possible superiority the price of being behind other Powers. Our authorities lay down that "it may be taken for granted that the single breech-loader will soon be as obsolete a weapon for military purposes as the muzzle-loader." It is to be hoped therefore that the question will be shortly settled. The solution expected is the speedy adoption of the Enfield Lee with one or two slight alterations, a piece above the breech-bolt being fixed by a new screw and a cover being added. It is also expected that to meet immediate needs a magazine designed by Captain Greville Harston will be supplied to 200,000 Martini-Henrys in the service. It is claimed for this magazine that it makes the Martini rifle equal to any. Eighteen rounds have been fired in thirty seconds. The magazine is detachable, and can be replaced in two seconds. The cost of application of this magazine to the Martini rifle is estimated at 20*s.* per arm.

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TABLES OF BRITISH AND FOREIGN GUNS.

The greater part of the following Tables have been copied from the Austrian *Marine Almanack*, being compared and corrected with that for 1889. As in the *Annual* for last year, a few alterations and additions have been made, and the foreign measures have been converted into English. The perforations given in the above-mentioned work have hitherto been less than would be given on any system used in England. The French Table however, which was in a great measure a new one for 1888, had perforations calculated on some system giving much larger results. For example, for the 32-cm. gun with 31·71 mt. energy per cm. circumference, the perforation in 1887 was 396, and in 1888 it was 450 cm. In 1889, however, this was again altered to 393, while the whole of the perforations in the tables were altered. This does not affect the tables here given, for which the total energies, energies per inch circumference, and perforations, are calculated on the same system as for previous years.

The British Table is the official one as abbreviated by Major Mackinlay, corrected as far as possible up to date. In a few cases, where larger charges of slower burning powder have been substituted for smaller charges of quicker burning powder, the muzzle velocities and energies may be slightly incorrect. Where mistakes were detected in details of Elswick guns sent abroad, reference has been made to Elswick.

The Table of United States Naval Ordnance was obtained from Lieut. Jacques, U.S. Navy, last year, and is repeated this year; probably some advance has been made in the meantime, but the larger guns still exist only on paper.

The Table for conversion of foreign measures is one worked out by Major Mackinlay, R.A., for his official Text Book of Gunnery. The figures are taken from various sources, chiefly Colonel Noble's useful Tables.

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BRITISH RIFLED ORDNANCE.

(Chiefly founded on the official "List of Service Rifled Ordnance, 1886," corrected up to date.)

Ordnance.													Charge (full).	Projectile.					Ballistics (with full charges).				
Nature.			Chamber.					Rifling.															
	Calibre or Pr.	Weight.	Mark and Service.	Total length in inches.	Length of Bore including Chamber.	Diameter.	Length to base of projectile.	Capacity.	Twist one turn in			System.*	Weight.§	Diameter.	Weight.†	Value of $\frac{d^2}{w}$.	Value of $\frac{w}{d^2}$.	Muzzle velocity.	Total muzzle energy.	Muzzle energy per ton of gun.	Perforation of wrought iron.		
									Least at breech.	Greatest at muzzle.	Distance at muzzle twist is uniform.										At muzzle.	At 1000 yards range.	At 2000 yards range.
						ins.	ins.	cub. ins.	cals.	cals.	ins.		lbs.	ins.	lbs. ozs.			f. s.	ft. tons.	ft. tons.	ins.	ins.	ins.
B.L. Guns (new type).	16·25-in.	111 tons.	I. S.	524·0	30·0	21·125	84·5	28,660	..	..	..	P.	960 S.B.C. / 850 WBPr.	16·25	1800 0	0·146	0·421	2104 / 2148	55,250 / 57,580	498 / 518·8	34·5 / 35·2	.. / 32	.. / 29
	13·5-in.	67 tons.	II. S.	433·0	30·0	18·0	66·5	17,100	120	30	131·0	P.M.B.	630 S.B.C.	13·5	1250 0	..	..	2025	35,560	530·7	30·4	28	26
	12-in.	45 tons. / 44 tons.	IV. V. S. / III.	328·5	25·13	16·0	48·0	9,666	120	35	125·5	P.M.B.	295 Pr.[1]B.	12·0	714 0	0·202	0·413	1892	18,060	420·1	22·5	20·6	18·8
	10-in.	29 tons.	II.	342·0	32·0	14·0	54·0	8,370	120	30	166·7	P.M.B.	250 Pr.[1]B.	10·0	500 0	..	..	2100‡	15,290	527	23	21·0	19
	9·2-in.	21 & 22 tns.	I. II. S.	250·8	25·0	11·0	44·0	4,300	120	35	76·1	P.M.B.	144 Pr.[1]B.	9·2	380 0	..	..	1809	8,622	411 / 392	18·0	17	15
	9·2-in.	24 & 22 tns.	III. IV. V. S.	310·0	28·4	12·0	43·0	5,000	120	30	120·4	P.M.B.	170 Pr.[1]B.	9·2	380 0	0·238	0·477	2065	11,230	511·1	20·3	19	17
	8-in.	14 tons.	VI. S.	254·5	29·6	10·5	38·0	3,350	120	35	96·1	P.M.B.	125 Pr.[1]B.	8·0	210 0	0·305	0·410	2200‡	7,060	508·2	17·4	16	14
	6-in.	5 tons.	IV. S.	173·5	26·0	8·0	26·75	1,380	120	35	61·75	P.M.B.	42 Pb.[2]	6·0	100 0	0·360	0·433	1960	2665	533	12·5	10·0	8·0
	5-in.	40 cwt.	III. & IV. S.	139·5	25·06	5·75	19·05	504	120	25	51·8	P.M.B.	16 S.Pb.	5·0	50 0	0·500	0·400	1800	1,123	561	9	7	5
	4-in.	26 cwt.	IV. & V. S.	120·0	27·0	5·3	18·5	417	120	30	43·77	P.M.B.	12 S.Pb.	4·0	25 0	0·640	0·391	1900	625·1	500·8	7·3	6	5
	4-in.	13 cwt.	I. S.	66·0	14·81	4·5	8·12	126·5	116	35	11·39	P.M.B.	3½ R.L.G[2].	4·0	25 0	0·640	0·391	1180	242	372	4	3·4	3·0
	12-pr.	7 cwt.	I. L.	92·3	28·0	3·625	11·0	117	120	28	35·8	P.M.B.	4 S.Pb.	3·0	12 2	0·720	0·463	1730	252	720	..	..	..
M.L. Guns.	17·72-in.	100 tons.	I. L.	391·8	20·43	19·7	59·72	16,957	150	50	2·88	P.M.M.	450 Pr[1] or r[2] B	17·72	1968 0	0·159	0·374	1548	32,710	327	24·5	23	21
	16-in.	80 tons.	I. S. & L.	321·0	18·0	18·0	59·6	14,600	0	50	0	P.M.M.	450 Pr.[1]B.	16·0	1684 0	0·152	0·411	1590	29,530	369	25	23	22
	12·5-in.	38 tons.	II. S. & L.	230·0	15·84	14·0	41·125	6,000	438	35	0	W.	210 Pr.[2] or Pr.[1] black 190	12·5	809 12½	0·193	0·415	1575	13,930	366·6	19·4	18	16
	12-in.	35 tons.	I. S. & L.	195·0	13·54	Unchambered			0	35	0	W.	140 Pb.[2]	12·0	706 12	0·204	0·409	1390	9,469	250·5	16	15	13
	12-in.	25 tons.	II. S. & L.	182·5	12·09	"			100	50	0	W.	85 Pb.[2]	12·0	608 12	0·237	0·352	1288	7,006	281·8	13·5	12	11
	11-in.	25 tons.	II. S. & L.	180·0	12·09	"			0	35	0	W.	85 Pb.	11·0	543 14	0·223	0·408	1314	6,561	262·4	15·6	14	13
	10-in.	18 tons.	II. S. & L.	180·0	11·55	"			100	40	0	W.	70 Pb.	10·0	406	0·216	0·406	1379	5,360	297·5	13	12	10

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M.L. Guns.	9-in.	12 tons.	V. S. & L.	156·0	13·88	Unchambered.			0	45	0	W.	50 Pb.	9·0	253	9	0·320	0·347	1440	3,695	304	11·7	10	9
	8-in.	9 tons.	III. S.	144·0	14·75	„			0	40	0	W.	35 Pb.	7·92	174	12	0·359	0·352	1384	2,391	258	9·6	8	7
	7-in.	90 cwt.	I. S.	131·0	15·88	„			35	35	All	W.	22 Pb.	6·92	112	1	0·427	0·338	1325	1,400	303	8	7	6
	7-in.	6½ tons.	III. S. & L.	133·0	15·88	„			35	35	All	W.	30 Pb.	6·92	112	1	..	..	1525	1,805	278	9·3	8	6
	7-in.	7 tons.	IV. L.	148·0	18·0	„			35	35	All	W.	30 Pb.	6·92	112	1	0·427	0·338	1561	1,892	270	9·6	8	6
	6·6-in.	70 cwt.	I. L.	118·0	14·78	6·8	21·0	709	100	35	13·2	P.M.M.	25 Pb.	6·6	97	12	0·446	0·340	1416	1,358	388	..	..	..
	64-pr.	64 cwt.	I. II. L.	I. 120·0 II. 119·5	15·55	Unchambered.			40	40	All	Pl.	6½ R.L.G.[4]	6·28	64	8	0·588	0·271	1125	565	177	..	..	..
	64-pr.	64 cwt.	III. S. & L.	118·0	15·55	„			40	40	All	Pl.	10 R.L.G.[4]	6·28	64	8	0·588	0·271	1390	897	270	..	..	..
	40-pr.	35 cwt.	II. L.	120·0	22·0	„			35	35	All	W.	6¾ R.L.G.[4]	4·75	39	8½	0·552	0·382	1415	548	313	..	..	..
	25-pr.	18 cwt.	I. L.	98·0	22·0	„			35	35	All	W.	4½ R.L.G.[4]	3·94	24	15	0·605	0·420	1363	322	358	..	..	..
	16-pr.	12 cwt.	I. L.	78·0	19·0	„			30	30	All	F.M.	3 3/16 R.L.G.[2]	3·54	16	1½	0·771	0·366	1355	199	332·7	..	..	..
	13-pr.	8 cwt.	I. L.	92·1	28·0	3·15	14·13	109	100	30	9·0	P.M.M.	3½ R.L.G.[4]	3·0	13	0¼	0·689	0·484	1596	229	572	..	..	..
	9-pr.	6 cwt. 8 cwt.	II.III.S.&L. I. II. III. IV. S. & L.	74·5 72·0	22·0 21·17	Unchambered.			30	30	All	F.M.	1⅝ R.L.G.[2] and 1½ R.L.G.[2]	2·94	9	0	0·946	0·359	1390	121	403	..	..	..
	2·5-in.	400 lbs.	I. L.	70·45	26·6	2·56	11·07	54	80	30	3·53	P.M.M.	1½ R.L.G.[2]	2·5	7	4	0·893	0·448	1440	101	566	..	..	..
	7-pr.	200 lbs.	IV. S. & L.	41·0	12·0	Unchambered.			20	20	All	F.	¾ R.F.G.	2·94	7	5½	1·181	0·288	950	46	515	..	..	..
R.B.L. guns (screw).	7-in.	82 cwt.	S. & L.	120·0	14·21	7·2	16·0	620·0	37	37	All	P.	11 RL.G.[2]	7·0	109	0	0·450	0·318	1100	915	223	..	..	..
	40-pr.	35 cwt.	S. & L.	121·0	22·39	4·96	13·5	257·8	36½	36½	All	P.	5 R.L.G.[2]	4·75	40	9	0·562	0·374	1180	391	223	..	..	..
	20-pr.	16 cwt.	L.	96·0	22·4	3·94	12·0	143·0	38	38	All	P.	2½	3·75	22	1½	0·645	0·414	1130	196	245	..	..	..
		15&13cwt.	S.	66·125	14·43	3·94	11·0	131·0	38	38	All	P.	2½ R.L.G.[2] or R.L.G.	3·75	22	1½	0·645	0·414	1100	186	248	..	..	..
	12-pr.	8 cwt.	S. & L.	72·0	20·458	3·2	8·5	66·0	38	38	All	P.	1½	3·0	11	4	0·800	0·417	1239	120	283	..	..	..
	9-pr.	6 cwt.	S. & L.	62·0	17·5	3·2	7·0	55·1	38	38	All	P.	1⅛	3·0	8	8½	1·059	0·315	1055	66	220	..	..	..
	6-pr.	3 cwt.	S. & L.	60·125	21·2	2·625	7·0	37·9	30	30	All	P.	¾		5	15			1046	45	300			
Quick Firing Guns.																								Mild steel plate.
Hotchkiss	6-pr.	8 cwt.	S.			..	..	..	..	..	..	..	1 15½	2·25	6	0	0·844	0·527	1820	137·8	344·5	3·2	2·0	..
Nordenfelt	6-pr.	6 cwt.	S.			..	..	..	0	26	0	..	1 15½	2·25	6	0	0·844	0·527	1860	143.9	479·6	3·3	2·1	..
Hotchkiss	3-pr.	4 cwt.	S.			..	..	..	25	25	All	..	1 8	1·85	3	8	0·978	0·553	1873	77·6	485·5	2·9	1·8	..
Machine Guns.													grains.		oz.	grs.								
Nordenfelt, 4 bar. 1-in.		447 lbs.	III. S.			..	..	..	35	35	All	H.	625	1·0	7¼	0	2·207	0·453	..	..	..	..		¼-in. at 200 yards.
Gatling, 10 bar 0·65-in.		787 lbs.	S. & L.			..	..	..	46·5	46·5	All	H.	270	0·65	0	1422	2	109	0·730	..	..	..		Not known.
Gardner, 2 bar 0·45-in.		131 lbs.	S. & L.			..	..	..	22·0	22·0	All	H.	85	0·450		480	2	952	0·751	..	..	..		Same as M.H. bullet

S., Sea-service gun; L., Land-service. The Roman numeral is the number of the pattern given.

* P means Polygroove; M.M., Maitland muzzle-loading, and M.B., Maitland breech-loading; Pl., Plain; W., Woolwich; F., French; F.M., French modified; H., Henry. † For the higher natures the weight of projectile given is for Palliser shot; for the lower natures it is for filled common shell. ‡ Estimated. § S.B.C. (in column for charge) means Slow-burning Cocoa; W.B.Pr., Westphalian Brown Prism; P.B. stands for Prismatic Brown; Pb., Pebble; R.L.G., Rifle Large Grain; L.G., Large Grain.

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AUSTRIAN NAVAL ORDNANCE.

	Krupp Steel B.L. Guns.										Armstrong.		Uchatius.				Cast Iron BL.
				1st Class.	2nd Class.		Long.	Short.	Short.	Long.							
Designation by Calibre, in centimètres	30·5	28	26	24	24	21	15	15	15	12	23	18	15	12	9	7	15
Calibre, in inches	12·01	11·02	10·24	9·27	9·27	8·24	5·87	15·87	5·87	4·72	9·00	7·00	5·87	4·72	3·43	2·60	5·87
Length — Total, in Feet	35·11	20·01	18·77	17·16	15·45	13·73	17·13	12·63	12·63	13·8	13·00	10·83	12·19	13·97	6·76	3·28	10·13
Length — Rifled Portion, in inches	314·8	169·8	148·4	135·9	115·3	105·0	149·6	05·7	111·6	128·5	104·0	85·5	111·4	123·8	57·5	23·8	89·8
Length — Powder Chamber „	69·9	37·4	46·1	41·7	41·7	37·0	35·4	29·3	23·4	24·0	21·0	18·7	23·6	31·65	16·5	11·0	18·0
Length — Of bore in calibres	32 0	18·8	19·0	19·2	16·9	17·2	31·5	23·0	23·0	32·0	13·9	14·9	23·0	32 9	21·6	13·4	18·4
No. of Grooves	68	64	32	32	32	30	36	24	36	32	6	3	36	32	24	18	30
Twist in calibres.	..	45	70	70	64·7	59	25	68·4	45	25	45	35	45	25	45	30	63·2
Weight — Gun, including Breech Gear, tons	47·8	27·1	21·7	14·6	14·5	8·68	4·69	3·94	3·94	2·25	12·50	6·50	3·35	2·85	0·479	0·09	2·81
Weight — Breech Block, in lbs.	..	2315	1951	1411	1422	1080	..	321·9	321·9	..	..	..	209·4	211·6	55·1	18·7	176·4
Weight — Steel Shell „	1003·1	557·8	395·7	292·1	292·1	206·6	86·0	72·8	84·9	57·3	..	..	84·9	57·3	..	..	..
Weight — Chilled Shell „	..	..	..	..	308·6	196·2	..	..	..	..	255·7	117·7	..	..	..	..	..
Weight — Common Shell „	..	488·3	354·2	263·5	263·5	172·0	69·9	67·2 / 65·5	69·4	57·3	264·6	123·0	69·45	57·3	14·02 / 14·22	6·42	6·11
Weight — Shrapnel Shell „	..	..	..	..	..	..	71·9	67·2 / 65·5	69·4	57·3	..	..	69·45	57·3	15·76	6·88	6·79
Weight — Case Shot „	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16·53	6·94	38·4
Weight of Bursting Charge — Steel Shell „	..	14·3	8·8	6·6	6·6	4·4	1·76	1·65	2·09	0·55	..	..	2·09	0·55	..	..	..
Weight of Bursting Charge — Chilled Shell „	..	..	..	..	3·75	..	..	..	..	..	5·95	1·23	..	..	..	..	..
Weight of Bursting Charge — Common Shell „	..	18·7	20·3	15·0	15·0	15·0	3·86	3·86	5·07	3·53	18·5	7·94	5·07	2·21	0·46	0·18	1·87
Weight of Bursting Charge — Shrapnel Shell „	..	..	..	..	..	..	1·10	1·08	1·08	0·57	..	..	1·08	0·57	0·20	0·09	0·90
Weight of Firing Charge — Steel and Chilled Projectile, in lbs.	..	123·5*	89·3 B	76·1 B	52·9	50·7 C	38·8	21·6 C	20·9 C	19·8 B	50·7 P	28·7 P	20·9 C	19·8 Br	..	..	..
Weight of Firing Charge — Service „	..	123·5*	59·5	44·1	44·1	30·9	38·8	14·3 / 21·6	20·9 C	19·8 B	30·9 O	13·2 O	20·9 C	19·8 B	3·31 / 0·97	0·77 O / 0·35	4·74
Weight of Firing Charge — Exercising „	..	68·3	59·5	44·1	44·1	30·9	19·6	21·6 C	20·9 C	11·0	30·9 O	13·2 O	20·9 C	12·13 B	3·31	0·77 O / 0·35	4·74
Weight of Firing Charge — Saluting „	..	19·8 O	19·8 O	15·4 O	15·4 O	8·82 O	4·74 O	4·74 O	4·74 O	..	15·4 O	8·8 O	4·74 O	..	0·88 O	0·35	4·74
Muzzle Velocity, in feet	..	1568	1575	1421	1378 / 1345	1519	1969	1641	1562	1738	1490	1522	1562	1755	1470	978	1017
Muzzle Energy — Total, foot tons	..	9513	6808	4087	3847	3306	2312	1358	1435	1201	3933	1891	1435	1224	..	..	..
Muzzle Energy — Per inch circumference, foot-tons	..	270·4	211·6	140·4	132·1	127·7	125·4	73·7	77·9	81·0	140·4	87·0	77·9	82·45	..	..	..
Thickness of Iron, perforated inches at Muzzle	..	17·0	15·0	12·1	11·7	11·6	11·7	8·8	9·1	9·4	12·2	9·6	9·1	9·45	..	..	..

NOTE.—P stands for pebble powder; C for cube powder; * prismatic powder; O ordinary powder (inferior); B brown prismatic.

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DANISH NAVAL ORDNANCE.

	Krupp B.L. Guns designated.										Armstrong M.L.						Finn pong
Designation by Calibre	35·5 cm.	30·5 cm.	26 cm. long.	26 cm. short.	15 cm. long.	15 cm. medium.	15 cm. short.	12 cm. long.	12 cm. short.	8·6 cm.	10 in.	10 in.	10 in.	9 in.	8 in.	8 in.	6 in.
Calibre, in inches	13·98	12·01	10·24	10·24	5·91	5·91	5·91	4·72	4·72	3·43	10·0	10 in.	10 in.	9·0	8·0	8 in.	6·04
Total length, in feet	29·1	22·0	32·8	18·77	17·1	12·63	10·7	11·8	9·6	6·9	17·0	14·5	14·0	13·0	10·8	10·8	9·5
Length of Bore, including Powder Chamber — in inches	304·7	227·2	327·6	194·5	190·3	135·0	112·9	128·8	102·4	73·6	175·5	145·5	140·0	125·0	104·2	104·2	100·8
Length of Bore, including Powder Chamber — in calibres	21·8	18·9	32·0	19·0	32·2	22·8	19·1	27·3	21·7	21·3	17·5	14·55	14·0	13·3	13·1	13·1	16·7
Number of Grooves	80	68	60	60	36	36	36	32	32	24	7	7	7	6	6	6	6
Twist of Rifling, in calibres	45	45	70·25	45	70·25	45	45	25	40	45	40	40	40	40	50	50	40
Total weight, including Breech-gear, tons	51·2	35·4	27·6	21·5	4·6	3·9	3·5	2·13	1·36	0·49	20·0	18·5	18·0	12·5	8·65	7·04	2·46
Weight of — Breech Block, lbs.	4695·8	2910	1982	1940	390·2	330·7	324·1	229·2	176·4	101·4	..	..	..	..	..	..	..
Weight of — Steel Shell, „	1157·4	725·3	451·9	451·9	112·4	..	..	..	..	..	..	..	..	..	..	..	..
Weight of — Chilled Shell, „	1157·4	725·3	..	451·9	..	86·0	86·0	..	44·1	..	400	400	400	250·2	165·3	..	..
Weight of — Common Shell, „	1157·4	621·7	451·9	391·3	112·4	69·4	69·4	57·3	36·2	14·3	400	400	400	250·2	131·2	..	55·1
Weight of — Shrapnel Shell, „	..	..	..	..	..	..	..	..	..	..	..	..	..	..	149·9	..	15·4
Weight of — Case Shot, „	..	..	..	..	..	..	..	..	..	..	191·8	..	..	154·3	127·9	..	58·4
Weight of Bursting Charge — Steel Shell, „	27·6	18·5	11·5	11·5	2·2	..	..	..	..	..	..	..	..	..	..	..	..
Weight of Bursting Charge — Chilled Shell, „	..	9·9	..	6·0	..	1·1	..	..	0·55	..	4·4	4·4	4·4	..	..	..	..
Weight of Bursting Charge — Common Shell, „	33·5	32·6	23·1	20·9	5·62	4·2	4·19	1·21	2·4	0·44	26·5	26·5	26·5	18·5	7·5	7·5	5·0
Weight of Firing Charge — Steel or Chilled Shell, lbs.	297·6	158·7	191·8	99·2	40·8	18·7	22·0	..	8·8	..	69·4	69·4	69·4	43·0	29·8	29·8	..
Weight of Firing Charge — Common Shell, „	297·6	158·7	191·8	99·2	40·8	18·7	22·0	18·2	8·8	3·3	69·4	69·4	69·4	34·2	19·8	19·8	60·6
Muzzle Velocity — Armour-piercing Projectile, feet	1619	1558	2064	1558	1789	1562	1542	..	1416	..	1457	1404	1388	1368	1378	1378	..
Muzzle Velocity — Common Shell, „	1619	1673	2064	1673	1789	1683	1690	..	1549	1457	1457	1404	1388	1214	1230	1230	1076
Muzzle Energy — Total foot-tons	20970	12200	13550	7605	2494	1455	1418	..	6130	..	5889	5467	5347	3244	2177	2177	..
Muzzle Energy — Per inch circumference, foot tons	477·5	323·5	421·4	236·4	134·4	78·4	73·0	..	32·8	..	189·0	175·3	171·6	115·8	86·9	86·9	..
Perforation at Muzzle, in inches	22·5	18·56	21·5	15·86	12·1	9·1	8·8	..	5·8	..	14·1	13·5	13·3	11·0	9·5	9·5	..

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DUTCH NAVAL ORDNANCE.

	Krupp Breech Loading.				Armstrong Muzzle Loading.			Dutch Breech Loading.		
Designation by Calibre, in centimètres	28	17	15	12 No. 1.	28	23	18	12 No. 2.	12 No. 3.	7·5
Calibre, in inches	11·02	6·80	5·87	4·72	11·00	9·00	7·00	4·72	4·72	2·95
Total Length, in feet	20·01	13·94	12·63	6·89	14·42	13·00	11·00	6·89	6·89	7·87
Length of Rifled Portion of bore, in inches	170·8	112·7	111·8	61·4	119·0	104·0	95·5	61·4	61·4	43·2
Length of Powder Chamber „	36·4	36·0	23·2	13·0	26·0	21·9	15·5	13·0	13·0	6·7
Length of bore, in Calibres	18·8	21·9	23·0	15·8	12·1	14·0	15·9	15·8	15·8	17·5
Number of Grooves	64	42	36	12	9	6	3	12		20
Depth of Grooves, inches	0·069	0·118	0·118	0·492	2·000	1·80	1·80	0·118		0·049
Total Weight, in tons	27·21	5·51	3·94	0·79	24·46	12·50	7·17	0·93	0·90	0·21
Firing Charge — Armour Piercing Projectile, in lbs.	121·3	27·6	20·9	..	86·0	50·7	30·0			..
Firing Charge — Common Shell „	121·3	27·6	20·9	2·43	86·0	50·7	13·9	2·43		0·82
Weight — Armour-piercing Projectile „	560·0	132·3	86·0	41·0	533·5	249·1	114·6	..		..
Weight — Common Shell „	476·2	112·4	69·4	29·5	535·7	262·4	116·8	29·5		9·5
Weight — Case Shot „	273·4	63·9	41·9	26·5	185·2	149·9	68·3	26·5		9·3
Bursting Charge — Armour-piercing Projectile „	6·6	2·2	1·1	0·44	4·4	2·2	2·2	..		..
Bursting Charge — Common Shell „	26·5	6·6	6·6	2·0	28·7	17·6	8·8	1·8		0·44
Muzzle Velocity, feet	1558	1558	1558	971	1332	1476	1558	951		958
Muzzle Energy — Total, in foot-tons	9423	2226	1447	..	6563	3763	1929	..		..
Muzzle Energy — Per inch Circumference, foot-tons	272	104	84	..	191	134	89	..		..
Perforation at Muzzle, in inches	17·0	10·5	9·1	..	14·0	11·9	9·7	..		..

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FRENCH NAVAL ORDNANCE.

Date of Pattern of Gun.	1875.	1884.	1875–1879.	1881.										1875.		Jacketed. 1870.				Jacketed. 1870–75.		1875.	1870.		
Desig. by Calibre, in cms.	42	37	37	34 long.	34 short.	27	24	16 heavy.	16 light.	14	10	mm. 9·0	mm. 6·5	34	27 No. 1	32	27	24	14	27 No. 1	10	10	32 long.	19 long.	16
Calibre, in inches . .	16·54	14·66	14·57	13·39	13·39	10·8	9·4	6·49	6·49	5·46	3·94	3·54	2·57	13·4	10 8	12·6	10·8	9·45	5·46	10·8	3·94	3·94	12·6	7·64	6·49
Total length, in feet . .	32·5	..	34·6	31·8	23.4	25·7	22·4	16·0	16·0	14·3	9·3	7·1	3·8	22	19·3	22·0	17·7	16·2	10·3	19·3	9·3	9·3	22·0	13·6	12·2
Length of Bore, in inches .	366·0	..	..	..	..	..	..[1]	180·9	180·9	162·6	102·6	77·9	41·2	241·5	213·4	243·6	194·3	179·1	115·0	213·4	104·3	104·3	243·6	151·0	137·3
Length of Bore, in calibres	22·1	..	..	..	..	..	..	27·9	27·9	30	26	22	16	18	19·8	19·5	18·0	19·0	21·1	19·8	26·5	26·5	19·5	19·8	21·2
Number of Grooves . .	84	..	..	..	..	..	..	50	50	42	30	28	20	68	54	64	54	48	28	54	20	20	64	28	50
Depth of Grooves . .	0·079	..	..	..	0·059	..	..	0·039	0·039	0·035	0·028	0·024	0·020	0·059	0·059	0·059	0·059	0·059	0·047	0·059	0·032	0·032	0·059	0·059	0·039
Rifling Twist . . .	7°	..	..	..	..	..	..	7°	7°	7°	7°	7°	8°	4°	4°	4°	4°	4°	4°	4°	7°	7°	4°	4°	7°
Total weight, in tons .	74·6	71	75·1	51·9	47·0	27·4	17·7	5·0	3·9	3·2	1·16	0·54	0·09	47·6	27·6	38·4	22·8	15·4	2·56	27·9	1·18	1·18	38·4	7·83	4·98
Weight of Firing Charge — Armour piercing projectile, lbs.	..	546	..	..	357·1	209·4	152·1	46·3	35·3	..	..	..	..	257·9	136·7	189·6	136·7	101·4	..	165·3	..	..	151·0	34·4	39·7
Weight of Firing Charge — Common Shell „	..	..	..	..	357·1	209·4	152·1	46·3	35·3	30·2	9·9	3·6	0·95	231·5	121·3	167·6	126·8	92·6	13·6	145·5	10·1	7·1	151·0	34·4	39·7
Weight — Armour Piercing Projectile, lbs.	1719·6	1180	1235	925·9	925·9	476·2	317·5	99·2	99·2	..	..	..	..	925·9	476·2	760·6	476·2	317·5	..	476·2	..	..	760·6	165·3	99·2
Weight — Common Shell „	..	..	1235	925·9	925·9	476·2	317·5	99·2	99·2	66·1	30·9	17·6	5·95	771·6	396·8	631·6	396·8	264·6	61·7	396·8	30·9	26·3	631·6	136·7	99·2
Weight — Case Shot „	..	..	..	..	..	..	..	..	..	66·1	30·9	17·6	5·95	..	321·9	..	321·9	220·5	42·8	321·9	18·7	18·7	..	..	68·3
Muzzle Velocity, in feet, sec.	1739	1955	2034	..	1821	2034	2034	1969	1821	1936	1673	1493	1135	1595	1641	1545	1575	1624	1529	1736	1673	1591	1437	1470	1782
Muzzle Energy — Total, in foot-tons	36040	31272	35420	2490?	21280	13660	9107	2668	2080	..	..	..	..	16320	8865	12590	8193	5794	1000?	9942	..	..	10880	2477	2183
Muzzle Energy — Per in. circ., ft.-tons	695·5	684	774	..	506·0	402·6	308·4	130·9	121·3	..	..	..	..	388	261	318	242	195	..	293	..	..	275	103·2	107
Perforation at Muzzle, ins.	27·4	27·4	29·2	..	23·45	21·38	18·4	12·0	11·5	..	..	..	..	20·3	16·7	18·3	16·0	14·4	..	17·8	..	..	16·9	10·4	10·8

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GERMAN NAVAL ORDNANCE.

	Krupp Steel Breech-loading Guns, designated by calibre.																						Bronze B.L.
Designation in centimètres	30·5 jack'd.	26 long.	26 jack'd.	26 short.	24 long.	24 short.	21 long.	21 long.	21 short.	21 short.	17 long.	17 short.	15 long.	15 short jack'd.	15 short.	15 short.	15 short jack'd.	15 short jack'd.	12·5 hoop'd.	12 hoop'd.	10·5 long.	8·7	8	8	8
Calibre, in inches	12·01	10·33	10·33	10·33	9·45	9·37	8·24	8·24	8·24	8·24	6·80	6·80	5·87	5·87	5·87	5·87	5·87	5·87	4·92	4·74	3·96	3·43	3·09	3·09	3·19
Length — Total, in feet	21·98	18·77	18·77	17·06	23·63	15·45	24·0	20·61	15·45	12·88	13·94	11·32	14·67	10·73	10·73	10·73	10·68	10·68	9·60	9·6	12·08	6·89	6·89	6·89	5·15
Length — Rifled portion, in ins.	181·9	149·8	150·0	129·3	201·6	116·2	218·2	176·5	124·6	114·9	117·1	102·2	128·5	93·3	87·1	86·7	87·1	86·7	85·7	85·3	113·6	62·7	57·6	57·6	45·9
Length — Powder Chamber „	45·3	44·7	44·4	44·7	53·5	40·9	75·3	46·7	37·1	34·0	31·5	16·7	31·1	19·0	25·1	25·5	25·1	25·5	16·7	16·7	19·5	10·7	10·5	10·5	9·73
Length — Bore, in calibres	18·9	18·8	18·8	16·8	26·1	16·8	35·6	27·1	19·6	18·1	21·9	17·5	27·2	19·1	19·1	19·1	19·1	19·1	20·8	21·6	33·6	21·4	22·0	22·0	17·4
Number of Grooves	72	36	48	36	56	48	48	48	30	30	30	30	36	36	36	24	36	24	32	18	32	24	12	12	12
Depth of Grooves, in inches	0·079	0·077	0·079	0·077	0·059	0·061	0·059	0·059	0·102	0·102	0·063	0·063	0·059	0·061	0·061	0·061	0·061	0·061	0·059	0·051	0·049	0·049	0·049	0·049	0·051
Twist, in calibres	45	50	50	50	25	45	25	25	68	59	45	45	25	45	45	68	50	65	40	60	25	40	46	46	46
Weight — Gun, including Breech Gear, tons	35·4	21·7	18·7	17·7	18·7	14·6	13·03	12·3	9·84	8·86	5·51	3·40	4·04	3·44	3·44	3·44	3·15	3·15	1·38	1·35	1·15	0·44	0·32	0·29	0·23
Weight — Breech Block, in lbs.	2954	2050	1973	1973	..	1378	831·1	908·3	831·1	831·1	496·0	414·5	390·2	324·1	324·1	324·1	324·1	381·4	163·1	163·1	149·9	86·0	63·9	63·9	55·1
Weight — Armour-piercing projectile, in lbs.	725·3	412·3	412·3	412·3	474·0	306·4	308·6	308·6	217·2	217·2	117·9	117·9	112·4	76·1	76·1	76·1	76·1	78·3	..	..	..	..	..	..	..
Weight — Common Shells, in lbs.	725·3	357·1	357·1	357·1	474·0	261·5	303·6	308·6	174·2	174·2	112·9	112·9	112·4	65·0	65·0	65·0	65·0	61·1	40·1	33·1	39·7	14·9	9·4	9·4	8·3
Weight of Bursting Charge — Armour-piercing Shells, in lbs.	7·7	5·3	5·3	5·3	6·6	3·2	5·5	5·5	2·8	2·8	1·3	1·3	1·5	0·8	0·8	0·8	0·8	..	..	..	..	..	..	..	..
Weight of Bursting Charge — Common Shells, in lbs.	19·8	14·3	14·3	22·0	15·4	15·4	12·1	12·1	6·6	6·6	5·1	5·1	4·3	4·2	4·2	4·2	4·2	..	2·4	2·5	0·9	0·4	0·4	0·6	0·6
Weight of Firing Charge — Armour-piercing Shells, in lbs.	202·8	105·8	105·8	125·7	152·1	67·2	103·6	103·6	41·9	35·3	30·9	16·5	33·1	14·3	17·1	13·2	17·1	13·2	..	..	..	..	..	..	..
Weight of Firing Charge — Common Shells, in lbs.	202·8	105·8	105·8	125·7	152.1	50·7	103·6	103·6	41·9	35·3	30·9	16·5	33·1	14·3	17·1	12·1	17·1	12·1	8·8	4·6	8·8	3·3	1·1	1·1	0·9
Initial Velocity — Armour-piercing projectile, ft.-sec.	1718	1588	1588	1578	1657	1493	1739	1657	1463	1316	1608	1326	1624	1463	1463	1358	1463	1358	..	...	..	..	..	..	..
Initial Velocity — Common shell, ft.-sec.	1713	1641	1641	1654	1657	1391	1739	1657	1394	1276	1654	1342	1624	1555	1555	1447	1555	1447	1545	1280	1526	1545	1148	1119	1053
Muzzle Energy — Total, foot-tons	14,740	7211	7211	7119	9024	4736	6471	5876	3225	2606	2112	1436	2055	1131	1131	974	1131	1002	..	..	..	..	..	..	..
Muzzle Energy — Per in. circ., ft.-tons	391	223	223	220	304	161	250·0	227	125	101	98·9	67·3	111·5	61·3	61·3	52·8	61·3	54·3	..	..	..	..	..	..	..
Perforation at Muzzle, in ins.	20·5	15·4	15·4	15·3	18·1	13·0	16·4	15·6	11·4	10·1	10·3	8·3	11·0	8·0	8·0	7·4	8·0	7·5	..	..	..	..	..	..	..

NOTE.—See two 40-cm. Krupp L.S. guns, given on Col. Maitland's Table, p. 357, *Annual* 1886, viz. 71 tons and 119 tons weight.

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ITALIAN NAVAL ORDNANCE.

		Armstrong Breech Loading.				B.L.	Armstrong Muzzle Loading.							Muzzle Loading. Old Pattern.		Breech Loading.	
Designation by Calibre, in centimètres		43 New Pattern.	43 Early Pattern. 1882.	15	12	12	45	28 New Pattern.	25 No. 1 Long.	25 No. 2 Short.	25 No. 2.	22	20	16	16	7·5 No. 1.	7·5 No. 2.
Calibre, in inches		17	17	5·91	4·72	4·7	17·72	11	10	10	10	9	8	6·5	6·5	3	3
Length	Total, in feet	40·75	39	13·8	8·5	9·25	32·7	14·4	14·4	14	13·8	13·8	10·8	11·8	10·6	5·8	3·3
	Rifled Bore, in inches	346·8	315·7	126	75	88	302	121	120	114	112	106	89	96	87	52	27
	Powder Chamber, in inches	84·5	98	28	10·8	22	56·5	24·5	26·0	26·0	14·0	19·5	15·7	21·3	21·3	10·2	7·9
	Bore, in Calibres	27	26	26	20·2	23·5	20·5	13·2	14·6	14·0	12·6	13·9	13·1	16·8	15·5	20·7	11·7
No. of Grooves		82	82	28	37	36	28	9	7	7	8	6	6	6	6	12	12
Twist of Rifling, in Calibres		50	50	40	40	42	50	35	40	40	55	45	45	42·5	27·3	48	48
Total Weight, in tons		104·3	101·5	4	1·21	1·38	100	25·0	18·0	18·0	12·1	12·6	7·02	5·12	3·54	0·29	0·095
Firing Charge	Armour-piercing projectile, in lbs.	900·0	725	34	..	..	551	94·8	77·2		63·9	50·0	35·0	19·8	..	..	..
	Common Shell	600	480	25	5·5	9·3	440·9	66·1	52·9		41·9	33·0	21·0	7·1	7·1	1·9	0·7
Weight	Armour-piercing projectile, in lbs.	2000	2000	80	..	..	2000	560·0	451·9		331·8	250·0	180·0	101·4	..	..	..
	Common Shell, in lbs.	2000	2000	80	32·4	36·4	2000	533·5	399·0		284·4	250·0	180·0	66·1		91·7	93·0
	Shrapnel, in lbs.	2000	2000	80	34·4	37·37	2000	533·5	399·0		284·4	250·0	180·0	66·1		91·7	93·0
	Case Shot „	2000	2000	70	23·5	35·9	2000	200·1	188·1		135·6	99·6	79·4	33·1		64·6	64·6
Bursting Charge	Armour-piercing projectile, in lbs.	32	32	1·5	..	..	32	15·0	11·1		8·4	6·3	3·6	..		..	..
	Common Shell, in lbs.	60	60	5	3·1	2·2	78	26·0	23·8		18·2	18·8	9·7	2·8		0·3	0·4
	Shrapnel „	5	5	0·16	0·28	0·35	5	2·2	1·85		1·96	1·48	0·71	0·50		0·02	0·02
Muzzle Velocity, in feet		1992	1935	1946	1345	1591	1700	1329	1388		1373	1442	1353	1303	1024	1335	..
Muzzle Energy	Total, foot-tons	55,030	51,930	2100	..	..	40,060	6859	6035		4369	36,040	22,850	1195	..	..	..
	Per inch circumference, foot-tons	1035	976·3	114·1	..	..	753·4	198·6	192 2		139·1	128·6	99·8	54·4	..	..	..
Perforation at Muzzle, inches		33·7	32·8	11·2	..	..	28·5	14·2	14·1		12·0	11·5	10·1	7·5	..	..	..

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RUSSIAN NAVAL ORDNANCE.

	Obuchoff Steel Breech Loading Hooped Guns.											Steel B.L. Guns.		
Designation by Calibre, in inches	12 Long.	12	11	11 Pattern 77.	9	9	8	6 Long.	6·03	6	Long 9-pdr.	4·2 (9-pdr.)	3·43 Long (4-pdr.)	3·43 (4-pdr.)
Calibre in centimètres	30·48	30·48	27·94	27·94	22·86	22·86	20·32	15·24	15·32	15·24	10·67	10·67	8·70	8·70
Total Length, in feet	30	20	18·3	20·0	15·0	13	14·6	14	12·2	11·7	6·9	7·0	6·9	5·8
Length of Rifled Portion of Bore, in inches	..	165·0	152·0	158·0	124·0	..	128·0	118·7	106·0	98·0	61·5	65·0	62·6	53·0
Length of Powder Chamber „	..	38·5	35·0	50·4	28·5	..	23·0	30·5	22·4	22·2	10·5	8·0	10·7	..
Length of Bore in calibres, including Powder Chamber	..	17	17	18·9	16·9	..	18·9	24·9	21·3	20	17·1	17·4	21·4	..
Number of Grooves, in inches	..	36	36	64	32	32	30	..	24	24	24	16	24	12
Depth of Grooves „	0·070	0·135	0·135	0·135	0·110	0·110	0·090	0·060	0·085	0·070	0·055	0·055	0·050	0·050
Twist of Rifling in calibres	..	73·5	70	..	60	60	70	*24	60	68	*40	50	40	41
Total Weight, in tons	50·45	39·9	28·2	28·2	15·0	12·5	9·67	4·07	4·35	4·03	0·60	0·87	0·45	0·35
Weight of Steel Shell, in lbs.	..	665·8	515·9	..	249·1	275·6	172·0	..	97·6	86·0	..	..	..	..
Weight of Chilled Shell, „	731·9	665·8	515·9	562·2	275·6	264·7	169·8	119·0	86·0	86·0	..	..	..	..
Weight of Common Shell, „	..	639·3	496·0	520·3	266·8	266·8	172·0	..	81·6	81·6	27·6	24·2	15·2	12·6
Weight of Case Shot, „	..	293·2	216·1	..	176·4	176·4	134·5	..	57·3	57·3	27·6	22·3	15·2	11·0
Weight of Firing Charge. Steel Shell, „	..	144·4	115·3	..	64·2	47·0	31·5	..	14·3	18·1	..	..	..	..
Weight of Firing Charge. Chilled Shell, „	246·9	144·6	90·6	132·2	47·0	47·0	29·3	37·5	14·3	18·1	..	..	..	..
Weight of Firing Charge. Common Shell, „	..	117·3	81·6	132·2	42·1	42·1	28·4	..	10·8	14·3	4·5	2·6	3·1	1·3
Muzzle Velocity, in feet	1942	1470	1486	1516	1463	1260	1352	..	1206	1463	..	..	1444	..
Muzzle Energy Total, foot-tons	19140	9965	7905	8999	3701	3035	2180	..	982	1276	..	..	..	..
Muzzle Energy Per Inch Circumference, foot-tons	508·4	264·5	229·4	260·4	130·9	107·4	86·7	..	51·8	67·74	..	..	..	..
Perforation † at Muzzle, in inches	23·6	16·7	15·5	16·6	11·7	10·5	9·5	..	7·2	8·4	..	..	..	..

* Maximum of increasing twist. † Through iron unbacked.

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	Hontoria, New Pattern.					Hontoria, Pattern 83.						Armstrong, Pattern 83.						Armstrong.			Krupp.				
	Breech Loading.					Breech Loading.												Muzzle Loading.		Pattrn. 81 B.L.	Breech Loading.				
Designation by Calibre	16-cm. No. 1.	16-cm.	12-cm.	9-cm.	7-cm.	32-cm.	28-cm.	24-cm.	20-cm.	16-cm.	12-cm.	24-cm.	20·3-cm	15-cm.	12-cm.	8·4-cm	7·5-cm long.	22·86-cm	20·3-cm	6-in.	15-cm.	12-cm.	8·7-cm	7·5-cm	7·5-cm short.
Calibre, in inches	6·34	6·34	4·72	3·54	2·76	12·60	11·02	9·45	7·87	6·34	4·72	9·449	8·00	6·00	4·72	3·3	2·95	9·00	8·00	6·00	5·87	4·72	3·43	2·95	2·95
Length — Total length, in feet	13·8	9·63	10·4	7·8	3·7	38·7	33·8	..	..	19·3	14·5	29	18·4	17·00	13·75	7·9	7·51	13·0	11·9	14·5	17·13	11·81	6·9	6·3	3·22
Length — Rifled Portion, in inches	125·6	89·8	94·5	70·9	35·4	352·4	309·1	..	..	170·9	135·8	260·2	162·0	158·3	135·8	75·0	70·7	104·0	102·0	126·9	..	..	..	57·6	..
Length — Powder Chamber, in inches	31·9	17·3	23·8	17·7	6·1	86·8	77·1	..	..	49·8	39·4	66·9	43·5	31·4	19	13	13	..	..	29·7	..	..	..	..	..
Length — Bore, in calibres.	25	16·9	25	25	15	36*	36*	..	..	36*	37*	35	26	32	33	27	28·7	14	14·75	26·1	35*	30*	24*	25·8*	13*
No. of Grooves	38	38	30	22	18	80	70	60	50	40	30	60	33	28	22	20	18	6	4	28	36	32	24	24	24
Depth of Grooves, in inches.	0·59	0·59	0·49	0·49	0·49	0·59	0·59	0·59	0·59	0·59	0·49	0·49	0·025	0·037	0·03	0·03	0·03	0·18	0·18	..	0·59	0·59	0·49	0·49	0·49
Twist of Rifling, in calibres.	Increasing from 100 to 49.	56	Increasing from 100 to 40.			From 0 to 30.						30	45	30	40	30	35	45	40	100 to 40	25	25	40	36	25
Total Weight, in tons	5·6	2·71	1·4	0·59	0·10	48·2	32·5	19·8	11·5	6·1	2·6	21	11·5	5·0	2·2	0·45	0·35	12·5	9·0	4·0	4·6	2·1	0·49	0·30	0·09
Weight — Armour-piercing projectile, in lbs.	93·7	..	..	..	..	1058	727·5	440·9	253·5	132·3	55·1	445	180	100·0	40·0	..	..	2500	180·0	78·0	85·10	43·65	..	..	..
Weight — Common Shell, in lbs.	83·8	63·9	36·2	15·4	7·28	..	..	..	..	116·8	49·6	393	180	100·0	40·0	15·0	12·0	2500	180·0	83·6	65·70	34·61	14·6	9·48	9·48
Weight — Ring Segment, in lbs.	83·8	..	33·1	17·0	7·9	..	..	..	..	116·8	49·6	..	..	..	40·0	15·0	12·0	..	..	..	..	34·61	14·6	9.04	9·04
Firing Charge — Armour-piercing projectile, in lbs.	26·5	..	..	..	..	..	..	..	..	..	..	220	90	55·0	16·0	..	..	50·0	35·0	34·0	37·48	19·29	..	..	..
Firing Charge — Other projectiles	24·3	15·4	13·2	6·28	0·99	..	..	..	..	..	..	145	65	34·0	12·0	4·0	3·75	33·0	21·0	39·0	..	..	10·3	10·4	..
Muzzle Velocity, in feet	1631	1493	1749	1837	1037	..	..	..	..	..	..	1950	2020	2070	2000	1625	1709	..	..	1936	2182	2034	1539	1542	961
Muzzle Energy — Total, in foot-tons	1729	988	702	..	..	..	..	..	..	..	..	11730	5094	2972	1109	275	243	..	..	2173	2809	1252	..	..	..
Muzzle Energy — Per inch circumference, foot-tons	87·4	..	..	..	..	..	..	..	..	..	..	397·4	203·8	156·4	75·15	..	..	..	..	..	152·4	84·45	..	..	..
Perforation at Muzzle, in inches	9·6	..	..	..	..	..	..	..	..	..	..	20·9	15·0	13·22	9·09	..	..	..	..	..	12·9	9·63	..	..	..

18 and 16-cm. Palliser guns and 16 and 13-cm. Parrot guns also exist.

* Total length, the length of bore not being supplied.

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NAVAL ORDNANCE OF SWEDEN AND NORWAY.

	Sweden.				Norway.								
	Breech Loaders.			M.L.	Krupp, Hooped B.L.		Armstrong, M.L.				Palliser, M.L.		Cast-Iron, M.L.
Designation by Calibre	27-cm.	24-cm.	17-cm.	12-cm.	26-cm.	15-cm.	8½-in.	8½-in.	8½-in.	6½-in.	5½-in.	5-in.	5-in.
Calibre, inches	10·80	9·45	6·58	4·80	10·24	5·91	10·51	10·51	10·51	7·88	6·58	6·11	6·11
Total Length, feet	17·46	14·96	11·27	8·87	18·77	12·63	16·87	14·66	13·49	10·82	11·58	10·30	11·21
Length — Rifled Portion of Bore, in inches	161·8	138·0	108·6	83·3	160·4	112·4	137·3	121·0	110·6	85·7	92·4	91·7	101·6
Length — Chamber, „	30·0	26·7	16·8	13·6	34·1	22·6	38·2	24·0	20·5	18·5	19·3	10·8	14·5
Length — Bore in calibres, „	17·8	17·4	19·1	20·2	19·0	22·8	16·7	13·8	12·5	13·2	17·0	16·8	19·0
Number of Grooves	5	5	5	8	60	36	8	8	8	6	3	3	3
Twist of Rifling	..	30	..	40	45	45	55	55	55	50	34	34	34
Total Weight, tons	23·9	14·4	5·2	1·9	21·7	3·9	21·4	19·5	18·1	7·5	4·8	3·4	2·9
Weight of — Chilled Shell, lbs.	476·2	317·5	108·0	..	463·0	86·0	447·5	385·8	385·8	153·2	110·2	..	..
Weight of — Common Shell, „	396·8	224·9	76·3	34·6	381·4	69·4	308·6	308·6	308·6	148·8	82·7	59·1	59·1
Weight of Firing Charge — Chilled Shell, lbs.	98·1	59·5	23·4	..	99·2	18·7	121·3	71·7	66·1	29·7	22·0	..	..
Weight of Firing Charge — Common Shell, „	66·1	37·5	17·6	6·6	81·6	18·7	77·2	38·6	38·6	19·8	11·0	7·17	7·17
Muzzle Velocity, feet.	1365	1322	1378	..	1575	1575	1555	1378	1296	1296	1329	..	..
Total foot-tons	6152	3848	1422	..	7966	1479	7502	5082	4495	1785	1350	..	..
Muzzle Energy — Per inch Circumference	179·6	129·6	68·8	..	247·7	79·7	227·3	153·9	136·1	72·1	65·3	..	..
Muzzle Energy — Perforation through Iron	13·65	11·5	8·4	..	16·2	9·2	15·6	12·6	11·8	8·6	8·2	..	..

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UNITED STATES—NAVAL ORDNANCE.

Supplied by Lieut. JACQUES, U.S. Navy.

Forged Steel, built up B.-L. Guns.

NAME OF GUN.	Calibre.	Length of Gun.					Twist of Rifling.	Weight of Projectiles.			Charge.				Perforation of Wrought Iron at Muzzle.
		Total Length.	Length of Bore.		Rifled Portion.	Powder Chamber.		Total Weight.	Armour Piercing.	Common.	Firing.	Bursting.	Initial Velocity.	Muzzle Energy.	
	inch.	inch.	inch.	Cal.	inch.	inch.		tons.	lbs.	lbs.	lbs.	lbs. or oz.	ft. per sec.	ft.-tons.	inch.
FINISHED.															
5-in. B.L.R.	5	162·0	152	30·6	120·75	29·2		2·77	60	60	30	3	1960	1,599	10·6
6-in. B.L.R.	6	196	185·75	31·12	144·26	40·49		4·58	100	100	50	6	2105	3,072	13·4
8-in. B.L.R.	8	257·99	242·46	30·43	194·16	49·61		12·53	250	250	125	13	2050	7,286	17·8
10-in. B.L.R.	10	329·10	310·22	31·02	246·26	60·96		26	500	500	250	22	2100	15,290	23·1
UNDER CONSTRUCTION.															
8-in. B.L.R.	8	264·5	248·97	31·25	195·80	53·21		11·48	250	250	125	13	2100	7,643	18·3
10-in. B.L.R.	10	329·1	310·22	31·02	246 26	60·96		26·0	500	500	250	22	2100	15,290	23·1
10½-in. B.L.R.	10½	368·6	350·0	33·3	281·8	69·0		29·0	550	550	275	24	2100	16,813	23·7
FORGINGS CONTRACTED FOR.†															
12-in. B.L.R.	12	422·6	400·12	33·42	319·81	79·31		47·0	850	850	425	38	2100	25,984	27·6

1 turn in 30 cals.*

* Rifling polygroove, increasing twist. In the 8-inch Rifle, from 1 in 180 to 1 in 30 calibres at 13 inches from muzzle, then uniform.

† The 12-inch, as well as 6, 8, and 10-inch guns are to be finished in the Naval Ordnance Factory, Washington; 16-inch guns of 109 tons and 150 tons are designed.

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Table Relating to Conversion of Measures.

Length.

Metric to English. | English to Metric.

I. Mètres.	II. Yards.	III. Feet.	IV. Inches.	V. Yards.	VI. Mètres.	VII. Feet.	VIII. Mètres.	IX. Inches.	X. Centimètres.
1	1·0936	3·2809	39·37	1	0·91438	1	0·30479	1	2·5400
2	2·1873	6·5618	78·74	2	1·82877	2	0·60959	2	5·0799
3	3·2809	9·8427	118·11	3	2·74315	3	0·91438	3	7·6199
4	4·3745	13·1236	157·48	4	3·65753	4	1·21918	4	10·1598
5	5·4682	16·4045	196·85	5	4·57192	5	1·52397	5	12·6998
6	6·5618	19·6854	236·22	6	5·48630	6	1·82877	6	15·2397
7	7·6554	22·9663	275·60	7	6·40068	7	2·13356	7	17·7797
8	8·7491	26·2472	314·97	8	7·31507	8	2·43836	8	20·3196
9	9·8427	29·5281	354·34	9	8·22945	9	2·74315	9	22·8596

Explanation.—To convert any number from one measure to the other, take the values of the different multiples of 10 by shifting the position of the decimal point, and add together. Thus, find the number

of yards in 2354 mètres (see cols. I. & II.).	of feet in 12·4 mètres (see cols. I. & III.).	of inches in 30·5 centimètres (see cols. I. & IV.). Note, 1 m.=100 cm.	of mètres in 1026 yards (see cols. V. & VI.).	of mètres in 1742 feet (see cols. VII. & VIII.).	of centimètres in 17·72 ins. (see cols. IX. & X.)
mètres. yards.	mètres. feet.	cms. inches.	yards. mètres.	feet. mètres.	inches. cms.
2000=2187·3	10 =32·809	30·0=11·811	1000=914·38	1000=304·79	10·0 =25·400
300= 328·09	2 = 6·562	·5= ·197	20= 18·29	700=213·36	7·0 =17·780
50= 54·68	0·4= 1·312		6= 5·49	40= 12·19	0·7 = 1·778
4= 4·37				·2= 0·61	·02= ·051
∴ 2354=2574·44	∴ 12·4=40·683	∴ 30·5=12·008	∴ 1026=938·16	∴ 1742=530·95	∴ 17·72=45·009

Note.—A ready way of approximately converting all French measures into English inches is to multiply by 4 and apply the decimal point by common sense—Thus for a 15-cm. gun; 15 × 4 = 60. Now this Calibre cannot be 60 inches, nor can it be 0·6 inches, therefore it must be 6 inches. (The exact value is 5·906 in.)

Weight.

Metric to English. | English to Metric.

I. Kilogrammes.	II. Tons.	III. Pounds Avoirdupois.	IV. Grains Troy.	V. Tons.	VI. Milliers.	VII. Pounds Avoirdupois.	VIII. Kilogrammes.	IX. Grains. Troy.	X. Gramme.
1	·000984	2·2046	15432·3	1	1·016	1	0·4536	1	·0648
2	·001968	4·4092	30864·7	2	2·032	2	0·9072	2	·1296
3	·002953	6·6139	46297·0	3	3·048	3	1·3608	3	·1944
4	·003937	8·8185	61729·4	4	4·064	4	1·8144	4	·2592
5	·004921	11·0231	77161·7	5	5·080	5	2·2680	5	·3240
6	·005905	13·2277	92594·1	6	6·096	6	2·7216	6	·3888
7	·006889	15·4323	108026·4	7	7·112	7	3·1751	7	·4536
8	·007874	17·6370	123458·8	8	8·128	8	3·6287	8	·5184
9	·008858	19·8416	138891·1	9	9·144	9	4·0823	9	·5832

Explanation.—To convert any number from one measure to the other, take the values of the different multiples of 10 by shifting the position of the decimal point and add together. Thus, find the number

of tons in 35 milliers (see cols. I. & II. Note, 1000 kg. =1 millier).	of pounds in 56·3 kilogrammes. (see cols. I. & III.).	of grains in 120 grammes (see cols. I. & IV. Note, 1000 grms. = 1 kg.)	of milliers in 38 tons (see cols. V. & VI.).	of kilogrammes in 68 pounds (see cols. VII. & VIII.).	of grammes in 85 grains (see cols. IX. & X.).
milliers. tons.	kgrms. lbs.	grammes. grains.	tons. milliers.	lbs. kgs.	grains. grammes.
30 = 29·53	50 =110·231	100=1543·23	30 = 30·48	60 = 27·216	80 = 5·184
5 = 4·92	6 = 13·228	20= 308·65	8 = 8·13	8 = 3·629	5 = 0·324
	0·3= .661				
∴ 35 = 34·45	∴ 56·3=124·120	∴ 120=1851·88	∴ 38 = 38·61	∴ 68 = 30·845	∴ 85 = 5·508

Note.—7000 grains troy=1 pound avoirdupois.

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PRESSURE.

Metric to English.			English to Metric.				Atmospheric to English.		English to Atmospheric.	
I. Kilogrammes per square centimètre.	II. Pounds per square inch.	III. Tons per square inch.	IV. Pounds per square inch.	V. Kilogrammes per square centimètre.	VI. Tons per square inch.	VII. Kilogrammes per square centimètre.	VIII. Atmospheres.	IX. Tons per square inch.	X. Tons per square inch.	XI. Atmospheres.
1	14·223	·00635	1	·07031	1	157·49	1	·00656	1	152·38
2	28·446	·01270	2	·14062	2	314·99	2	·01313	2	304·76
3	42·668	·01905	3	·21093	3	472·48	3	·01969	3	457·14
4	56·891	·02540	4	·28124	4	629·97	4	·02625	4	609·52
5	71·114	·03175	5	·35155	5	787·47	5	·03281	5	761·91
6	85·337	·03810	6	·42186	6	944·96	6	·03938	6	914·29
7	99·560	·04445	7	·49217	7	1102·45	7	·04594	7	1066·67
8	113·783	·05080	8	·56248	8	1259·95	8	·05250	8	1219·05
9	128·005	·05715	9	·63279	9	1417·44	9	·05906	9	1371·43

Note.—One atmosphere is taken to be 14·7 lbs. per square inch.

Explanation.—To convert any number from one measure to the other, take the values of the different multiples of 10 by shifting the position of the decimal point, and add together. Thus, find the number

of pounds per square inch in 32·1 kilogrammes per square centimètre (see cols. I. & II.).		of tons per square inch in 3210 kilogrammes per square centimètre (see cols. I. & III.).		of kilogrammes per square centimètre in 15 lbs. per square inch (see cols. IV. & V.).		of kilogrammes per square centimètre in 18·3 tons per square inch (see cols. VI. & VII.).		of tons per square inch in 3254 atmospheres. (see cols. VIII. & IX.).		of atmospheres in 14·6 tons per square inch (see cols. X. & XI.).	
kgs. per sq. cm.	lbs. per sq. in.	kgs. per sq. cm.	tons per sq. in.	lbs. per sq. in.	kgs. per sq. cm.	tons per sq. in.	kgs. per sq. cm.	atmospheres.	tons per sq. inch.	tons per sq. in.	atmospheres.
30	= 426·68	3000	= 19·05	10	= ·7031	10	= 1574·9	3000	= 19·69	10	= 1523·8
2	= 28·45	200	= 1·27	5	= ·3516	8	= 1259·95	200	= 1·31	4	= 609·5
0·1	= 1·42	10	= ·06			0·3	= 47·25	50	= ·33	0·6	= 91·4
								4	= ·03		
∴ 32·1	= 456·55	∴ 3210	= 20·38	∴ 15	= 1·0547	∴ 18·3	= 2882·1	∴ 3254	= 21·36	∴ 14·6	= 2224·7

ENERGY.

Metric to English.		English to Metric.	
I. Mètre-tons.	II. Foot-tons.	III. Foot-tons.	IV. Mètre-tons.
1	3·2291	1	0·3097
2	6·4581	2	0·6194
3	9·6872	3	0·9291
4	12·9162	4	1·2388
5	16·1453	5	1·5484
6	19·3743	6	1·8581
7	22·6034	7	2·1678
8	25·8324	8	2·4775
9	29·0615	9	2·7872

1 mètre-tonne is termed a "dinamode" in Italy.

Explanation.—To convert any number from one measure to the other, take the values of the different multiples of 10 by shifting the position of the decimal point, and add together. Thus find the number

of foot-tons in 4367 mètre-tons (see cols. I. & II.).		of mètre-tons in 3592 foot-tons (see cols. III. & IV.).	
mètre-tons.	foot-tons.	foot-tons.	mètre-tons.
4000	= 12916·2	3000	= 929·1
300	= 968·72	500	= 154·84
60	= 193·74	90	= 27·87
7	= 22·60	2	= ·62
∴ 4367	= 14101·26	∴ 3592	= 1112·43

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PART IV.

STATISTICS, OFFICIAL STATEMENTS AND PAPERS.

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PART IV.

I.

Naval Manœuvres, 1888.

THE BRITISH NAVY.

EXTRACTS FROM THE INSTRUCTIONS TO THE COMMITTEE APPOINTED TO CONSIDER AND REPORT UPON THE LATE NAVAL MANŒUVRES.

To examine and consider very carefully the reports received from the Admirals in command, as well as those of the Umpires, and also the detailed statement of the facts in connection with the manœuvres which has been prepared by the Intelligence Department to be laid before the Committee; and to report generally as to the lessons which have been learned, and especially on the following points:—

The feasibility, or otherwise, of maintaining an effective blockade in war, of an enemy's squadron, or fast cruisers, in strongly fortified ports, including the advantages and disadvantages of—

(*a.*) Keeping the main body of the blockading fleets off the ports to be blockaded with an inshore squadron.

(*b.*) Keeping the main body of the blockading fleets at a base, with a squadron of fast cruisers and scouts off the blockaded ports, having means of rapid communication with the fleet.

(*c.*) In both cases the approximate relative number of battle-ships and cruisers that should be employed by the blockading fleet, as compared with those of the blockaded fleet.

The value of torpedo-gunboats and first-class torpedo-boats, both with the blockading and blockaded fleets, and the most efficient manner of utilizing them.

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As to the arrangements made by B squadron for the attack of commerce in the Channel, and by A squadron for its protection.

As to the feasibility and expediency of cruizers making raids on an enemy's coasts, and unprotected towns, for the purpose of levying contributions.

As to the claims and counterclaims made by the Admirals in command of both squadrons, with regard to captures made during the operations.

As to any defects of importance which were developed in any of the vessels employed, and their cause.

Supplementary Instructions.

I. As to the behaviour and sea-going qualities of, or the defects in, the new and most recently commissioned vessels, as obtained from the reports of the Admirals in command of the respective squadrons.

II. The general conclusion to be drawn from the recent operations.

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EXTRACTS FROM THE REPORT OF THE COMMITTEE ON THE NAVAL MANŒUVRES, 1888.

Admiralty, 21*st November*, 1888.

SIR,—In compliance with the directions of the Lords Commissioners of the Admiralty, as conveyed in your letter of the 12th ultimo, instructing us to examine and consider very carefully the reports received from the Admirals in command, and also the detailed statements of facts in connection with the late naval manœuvres, and to report generally as to the lessons which have been learned therefrom, I forward herewith a report as directed, which I request you will be pleased to submit for the consideration of their Lordships.

I have the honour to be,
Sir,
Your obedient Servant,
(Signed) W. M. DOWELL, *Admiral*,
Chairman.

The Secretary.

TO THE LORDS COMMISSIONERS OF THE ADMIRALTY.

REPORT.

As to—"The feasibility, or otherwise, of maintaining an effective blockade, in war, of an enemy's squadron, or fast cruisers, in strongly fortified ports, including the advantages and disadvantages of—

"(*a.*) Keeping the main body of a blockading fleet off the ports to be blockaded, with an inshore squadron.

"(*b.*) Keeping the main body of the blockading fleets at a base, with a squadron of fast cruisers and scouts off the blockaded ports, having means of rapid communication with the fleet.

"(*c.*) In both cases the approximate relative number of battle-ships and cruisers that should be employed by the blockading fleet, as compared with those of the blockaded."

(*a.*) Under the altered conditions which steam, and the development of attack by locomotive torpedoes, have introduced into naval

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warfare, it will not be found practicable to maintain an effective blockade of an enemy's squadrons in strongly fortified ports, by keeping the main body of the fleet off the port to be blockaded without the blockading battle-ships being in the proportion of at least five to three, to allow a sufficient margin for casualties—to which the enemy's vessels in a secure harbour would not be exposed—and the necessary periodical absence of a portion of the blockading squadron for the purpose of replenishing fuel, making good defects, &c. A still larger proportion might be necessary if the area to be covered by the blockaders was extensive.

Ratio of blockading to blockaded squadrons off enemy's port.

(*b.*) Provided that a suitable anchorage could be secured in the immediate neighbourhood of the enemy's stronghold, the advantages would be in favour of the ironclad fleet occupying such a position, and maintaining a sufficient number of swift look-out vessels off the port in direct communication, by signal, or cable from a telegraph look-out ship, with the Admiral. In such case the proportion of blockading battle-ships should not be less than four to three, and the squadron should be amply provided with colliers, and kept coaled up to full stowage, as it would be necessary to have steam always ready to close with the enemy should he leave his port, and endeavour to bring him to immediate action.

Ditto if good anchorage is found near the port.

We do not consider that a distant base would answer in this case.

Our ships should have greater speed than enemy's.

It should be the special object, in the construction of Her Majesty's ships, to insure their having superiority of speed over the vessels of similar class of all other maritime powers.

To insure having force sufficient to follow enemy's cruisers running a blockade without detriment to their general duties off the port, the proportion of fast cruisers employed in blockading should not be less than two to one of the blockaded, observing that there should always be at least one cruizer for every battle-ship in the blockading fleet for the maintenance of an efficient inshore squadron.

Proportions of fast cruisers.

As to—"The value of torpedo-gunboats and first-class torpedo-boats, both with the blockading and blockaded fleets, and the most efficient manner of utilizing them."

Torpedo-gunboats.

Torpedo-gunboats of high speed and good coal capacity would be of incalculable value to the blockading fleet, but torpedo-boats of any class at present in use would be of far more value to the blockaded squadron than to the blockaders. Torpedo-boats, if not capable of keeping the sea independently, under all conditions of weather, would inevitably prove a cause of embarrassment and anxiety to an Admiral commanding a blockading fleet, and would be subject to endless casualties.

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First-class torpedo-boats might, with advantage, accompany a fleet if carried in a specially-constructed vessel—superior class of Hecla—provided with suitable hydraulic cranes for hoisting them in and out. First-class torpedo-boats.

Second-class torpedo-boats, as carried in the ironclads, will, no doubt, prove useful on occasions. Second-class ditto.

We consider, however, the new type of Vedette boat preferable for sea-going battle-ships; they are better sea boats and, being built of wood, are less liable to damage and more easily repaired than torpedo-boats. Vedette boats.

The balance of opinion, in which we concur, is to the effect—

That the employment of torpedo-boats as an inner line of blockade is not desirable, they being calculated to cause much confusion and embarrassment to their friends. Torpedo-boats as inner line of blockade.

That they are admirably adapted for purposes of defence; but even then, without a very simple and perfect system of signals, they are liable to be taken for enemies by their own side. The documents before us show that this actually occurred once at least on each side in the course of these manœuvres. Friendly boats taken for enemy's.

That torpedo-boats should not be used as despatch vessels, or for any purpose other than that for which they are designed.

That torpedo-nets—certainly as at present fitted—cannot be carried by vessels under weigh without impairing their efficiency and compromising their safety. Torpedo-nets.

As to—"The arrangements by B squadron for the attack of commerce in the Channel, and by A squadron for its protection." B squadron's attack of the Channel and A's defence.

The arrangments made by the Admiral commanding B squadron for the attack on commerce in the Channel, and for its protection by the Admiral in command of A squadron, appear to have been such as would have been made in actual war by a powerful enemy, and by an Admiral commanding our sole squadron in the Channel respectively.

The Achill Admiral appears to have judged that, if he succeeded in breaking the blockade with a portion of his force, and in detaching it for the purpose of destroying the shipping in, and of levying contributions on, the principal centres of commerce of his enemy, and succeeded in the enterprise, he would be justified in risking the loss of some of his vessels in view of the panic he would create, and the far greater loss he would inflict. Achill Admiral's views.

In pursuance of this plan of operations, he, on the night of the 3rd–4th August, by an admirably contrived sortie in force by the eastern exit from Berehaven, succeeded in drawing the principal attention of the enemy upon himself, while the three cruisers, Warspite, Iris, and Severn—which vessels he intended should break Sortie from Berehaven.

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the blockade—escaped by the western, being favoured by a spirited attack by three torpedo-boats upon the Archer, the inshore vessel of the second line of blockade on that side.

Risks of the course taken.

This success was not effected without considerable risks having been run from the attacks of the admirably handled torpedo-boats of A squadron. The flag-ship (Hercules) herself had a narrow escape, a torpedo discharged from No. 76, Lieutenant Huddleston, having all but struck her; the Warspite also was endangered by an attack by No. 79, Lieutenant S. Nicholson.

Having accomplished his purpose, the Achill Admiral returned to port with the remainder of his ships.

Sortie from Lough Swilly.

The next night the Admiral second in command escaped from Lough Swilly in the Rodney, with two cruisers, Amphion and Spider, leaving the rest of his division there; on his departure he, for the purpose of deception, caused his flag to be displayed in the Black Prince during his absence.

Calypso, Amphion, Spider.

The Calypso, cruiser, had succeeded in breaking out of Lough Swilly unobserved on the night of the 2nd–3rd. This vessel proceeded on detached service, as did also the Amphion and Spider; their proceedings in raiding upon commercial ports and levying contributions on unprotected towns on the west coast of Scotland, and elsewhere, are reported in detail.

Rendezvous.

The Rear-Admiral proceeded alone in the Rodney to a rendezvous, 20′ north-east of St. Kilda, where he arrived at 5.20 P.M. on the 5th, and, by an excellent preconcerted arrangement, was joined there on the same night by the three ships, Warspite, Iris, and Severn, which had escaped from Berehaven. They then proceeded in company to the east coast of Scotland and England, with results as reported in Admiral Fitzroy's despatch.

The British Admiral, as is shown by the instructions issued beforehand for the guidance of the Rear-Admiral second in command, and the captains of his fleet at the commencement of the operations, appears to have determined that, if his enemy succeeded in breaking

Risk to "A²" squadron.

the blockade of Berehaven with three or more ships, the safety of "A²" squadron would have been compromised, and he would not be justified, with the force at his command, in leaving the approaches to London, the capital and heart of the Empire, unguarded.

Decision to raise the blockade.

He therefore, having decided to raise the blockade, for the reasons stated in his Letter of Proceedings, despatched the Mersey to Lough Swilly with instructions to the Rear-Admiral to raise the blockade of that port and to join forces with him at Drummore; the blockade was raised accordingly, and the two divisions formed a junction in Luce

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Bay on the night of the 5th, and the Admiral at once proceeded south with his whole fleet; at noon next day he arrived off Holyhead and stopped for a short time to communicate; the same evening the 2nd Division was detached to cover Liverpool.

1st Division.

The 1st Division, continuing on their southerly course, experienced very foggy weather, which caused considerable delay. On their way up Channel they coaled at Portland on the 9th, then proceeded to the Downs, where they arrived next day.

Rendezvous.

Meanwhile, on the 8th August, the Rear-Admiral had received orders to rendezvous off the Lizard, leaving two ironclads, one cruiser, and a torpedo-boat "for the defence of Liverpool and Holyhead," and subsequently (on the 10th) to join the Vice-Admiral in the Downs; this second junction was effected on the 12th.

The A squadron was then disposed as follows:—

Disposition of A squadron.

Detached squadron of six cruisers, under the Commodore, patrolling from South Foreland to Land's End;

Two ironclads and a torpedo-boat watching the mouth of the Thames; and—

The main body of the fleet together, sometimes at anchor in the Downs, and at others cruising in and about the Straits of Dover.

Achill squadron.

In the meantime, the Achill Admiral, finding the blockade of Berehaven abandoned, put to sea with his division (leaving one ironclad and his torpedo-boats for the defence of Berehaven, and two cruisers detached for attack on commerce) on the night of the 5th–6th, and proceeded round the west coast of Ireland to Lough Swilly, and having on the morning of the 8th formed a junction with the remainder of his squadron there assembled, he almost at once proceeded, with a force of five ironclads, two cruisers, and three torpedo-boats, for Liverpool, which was attacked and captured on the 9th, as reported in the Admiral's telegraphic despatch of that date.

Attack on Liverpool.

It nearly met "A²" squadron.

Here he appears to have had a narrow escape of falling in with the Admiral of "A²" in superior force, as, had the latter remained for the protection of Liverpool twenty-four hours longer, the two squadrons would probably have met off the port: but this illustrates the chances of war; it also points to the necessity of having an ample supply of swift cruisers attached to a fleet.

The British Admiral had lost touch of his enemy altogether, and, although the Achill Commander had intelligence that the British fleet had been seen off Holyhead on the 6th instant going south, he appears to have been quite unaware that the 2nd Division had doubled back.

Return to Lough Swilly.

After the attack on Liverpool, the enemy returned to Lough Swilly (reducing Holyhead *en route*); he arrived there at 9 P.M. on the 11th,

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and on the following morning at daylight was joined by the Rear-Admiral second in command on his return from the North Sea; five days were spent in coaling his fleet, and then the Rear-Admiral with his same three swift cruisers was despatched on special service, and the remainder of the ironclads (except Belleisle) were taken by the Achill Commander to Berehaven, whence, after breaking up the defences of that port, he proceeded towards the Channel.

Close of hostilities.

At noon on the 20th—the closing day of hostilities—the Rear-Admiral second in command of B squadron with his cruisers, forming an advanced guard, was within two hours of the Straits of Dover, the Admiral, with his remaining ironclads, being "in support" further west.

Opinion of arrangements made by the two Admirals.

There can be no doubt that the arrangements made by the Achill Commander for the attack on commerce were excellent. On the other hand, the British Admiral, apparently judging that he had an impossible task to perform with the force at his command, considered it his first duty to concentrate his forces for the protection of the English Channel and the approaches to the capital.

Raids.

As to—"The feasibility and expediency of cruisers making raids on an enemy's coasts and unprotected towns for the purpose of levying contributions."

There can be no doubt about the feasibility of such operations by a maritime enemy possessed of sufficient power; and, as to the expediency, there can be as little doubt but that any power at war with Great Britain will adopt every possible means of weakening her enemy: and we know of no means more efficacious for making an enemy feel the pinch of war than thus destroying his property, and touching his pocket.

The operations undertaken against British commerce and unprotected coast towns during the course of the manœuvres were briefly as follows:—

Calypso.

Raids.

The Calypso was the first to commence the raiding; she broke the blockade of Lough Swilly at 10 P.M. on the 2nd August, and proceeded

Port Ellen.

to Port Ellen, where she remained four hours; during this time she captured No. 50 torpedo-boat (belonging to A squadron), and destroyed

Oban.

two steamers, a tug, and the "coal stores;" thence to Oban, capturing steamers by the way: during her stay there of eight hours, *i.e.*, from 10 P.M. of the 3rd to 6 A.M. of the 4th, she claims to have requisitioned the town, besides capturing a one-gun battery, and several steamers.

She was next seen at a British port, when, at 6 A.M. on the 18th,

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she went in to Penzance, and in 2 hours 40 minutes captured the coastguard station (making a prisoner of the Inspecting Commander) and one steamer; Falmouth was visited on the same evening, and during a stay there of one and a quarter-hours—8.30 P.M. to 9.45 P.M. —her Captain claims to have seized the coastguard station, requisitioned the town, and captured or destroyed Her Majesty's ship Ganges and two training brigs. Penzance. Falmouth. Ganges and two training brigs.

Between the dates of the 4th–18th August the Calypso was cruising in the track of commerce, and claims for a total of 59,247 tons of shipping captured during that time were sent in. Calypso's claims.

It would seem that with regard to these claims for shipping, the "Rules as to Captures," as laid down in p. 6 of "Maritime Operations," were generally complied with by the Calypso, and the raids on Port Ellen, Oban, and Penzance—being all undefended—may be considered successful; but it is open to question whether the amount of damage claimed to have been done at Falmouth, which has the protection of Pendennis Castle, and St. Mawes Battery, could have been effected at all by one unarmoured ship.

SPIDER.

The Spider, which left Lough Swilly with Rodney and Amphion on the night of the 4th–5th August, broke the blockade at 1 A.M. (5th), proceeding first to Campbelltown; she arrived at that place at 6 A.M., and, after forty minutes stay, during which time over 5000 tons of shipping was destroyed, she went on to Rothsay, where a stoppage of thirty minutes was considered sufficient for the purpose of sinking five steamers; thence to Greenock, where an hour was spent in "destroying in detail all the shipping in the Clyde," of which over 32,000 tons are claimed, besides "firing on and destroying the principal public buildings near the quay." Raids. Campbelltown. Rothsay. Greenock. Shipping in the Clyde.

From Greenock she proceeded up the East Kyle of Bute, then down to Strone Point for the night. After that Cumbrae, Ardrossan, Gigha Island, Genarcardock Point, Crinan, Loch Tarbert, and the Sound of Islay were all visited between the 6th and 7th, and at most places large destruction was claimed. East Kyle of Bute. Cumbrae and Islay.

While it may be considered extremely doubtful whether any cruizer (the Spider for the purposes of the manœuvres being so classed) could have done anything like the amount of damage claimed in the time, even if she met with no resistance, yet her movements show that no great obstacle lies in the way of an enemy's cruiser entering any of the ports, including the Clyde, which were visited by Opinion.

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the Spider for a hostile purpose, and this fact points to the necessity of the proposed military defences of the latter place being taken in hand as soon as possible.

AMPHION.

Raids. The Amphion left Lough Swilly with Rodney, and broke the blockade with her on the night of the 4th–5th August. During her cruize in the Channel and up the east coast of Great Britain she Shipping. claims the destruction of much shipping, and the capture of the coast-guard stations at Scarborough and Wick, also, after leaving Lough Swilly the second time, to have visited Bude with a hostile purpose.

Scarborough. Wick. Bude. As Scarborough had already been attacked by Severn five days earlier, her visit there could not have been of much effect, neither Opinion. does it seem that any useful purpose was served on the occasion of her visit to Wick, as she was taken there in order that her captain might telegraph to the Achill Admiral through the enemy's wires, an impossible condition in war time. In no case, according to her log, does it appear that Rules as to Capture of shipping were adhered to.

VOLAGE.

The Volage left Berehaven at 9.20 P.M. on the 8th to "cruise on the path of steamers between the British Islands and America." Captures of shipping. Between the 9th and 18th she captured eight steamers and two sailing-vessels; in all cases the Rules as to Capture were complied with, but as among the names of steamers claimed are found the Gallia and Servia, Atlantic liners, with an ocean speed of 15 knots and 17 knots Opinion. respectively, it is most improbable that this ship, whose "full speed at sea" is given at 13·5 knots, could have effected the capture of these vessels supposing that any effort had been made on the part of their respective captains to evade the same. It may be observed that the highest speed which was attained by the Volage during the recent manœuvres was 11 knots.

SANDFLY.

Her mission. This vessel, whose mission was "to cruise off the port of Queenstown, using it as a base," left Berehaven at 8.30 P.M. on the 6th and reached Queenstown at 7 A.M. next day. She cruised daily off the port on the 8th, 9th, 10th, and 11th, also on the 13th, 14th, 15th, and 18th, returning into harbour each evening.

Shipping captured. During these daylight cruises the lieutenant in command of the Sandfly claims to have captured twenty-three steamers, many of them large Atlantic liners, and fifteen sailing-ships.

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As in the case of the Spider, she was, for the purpose of the manœuvres, classed as a cruiser; her reputed full speed is 19 knots, but by the official list she is only capable of keeping up 15 knots at sea.*

From the entries in her log it does not appear whether, in some cases, the Rules as to Capture were adhered to or not, but on the 8th, when the capture of the steamship Caspian was claimed, she was only absent from her buoy for one hour and ten minutes; and on the 13th, between 1.30 and 6 P.M., four sailing-vessels and one steamer are claimed, which, by the Rules, is inadmissible; again, on the 15th, only one and a-quarter hours elapsed between the capture of the great steamship City of Rome and that of a sailing-vessel (Lurlei). Opinion.

It is to be observed with reference to the Sandfly's captures of Atlantic "liners," &c., that she was using Queenstown as a base against vessels which were calling off the port quite unaware of its hostile character, an improbable condition in these days of cable communication, especially after a lapse of a fortnight from the outbreak of hostilities.

Detached Squadron.

With regard to the proceedings of the Rear-Admiral second in command on the east coast of Great Britain, his force, consisting of Rodney, Warspite, Iris, and Severn, arrived off Aberdeen at 4.15 A.M. of the 7th August, steamed into the bay and out again, the vessels making, according to their logs, 8 knots on their course to the southward between 4 and 5 A.M.; they were off the port half-an-hour at the outside, and did not communicate, and at 3.40 P.M. of the same day they opened fire on the Forth Bridge, distant from Aberdeen ninety miles. At 4.15 P.M. they were again abreast of the fort at Inchkeith, 9 miles down the Forth, where the vessels separated to carry out detached services for the purpose of destroying shipping at, and levying contributions on, the following ports:— Rodney. Warspite. Iris. Severn. Forth Bridge. Ships separated.

Rodney, the Tyne and Sunderland; Severn, Scarborough and Hartlepool; Warspite, Grimsby.

The Iris had been detached on the passage up the Forth to destroy the shipping at, and to requisition, Leith; she proceeded to the rendezvous on the completion of this service.

The squadron re-assembled at this rendezvous, latitude 56° 30′ N., longitude 0° 0′ on the morning of the 9th, and returned north of the

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Orkneys, and west of the Hebrides, to Lough Swilly, where they arrived at daybreak on the 12th.

Opinion. In none of these cases did the enemy remain any time off the ports attacked, and the rapidity of his movements secured him from the chance of interruption by the British squadron (supposing proper information to have been received by the Admiral in command from his central telegraph station), while it would have been impossible for him to do the mischief claimed to have been done without scattering his force for a much longer period and compromising its safety.

What the Admiral claims to have done with his detached squadron is this: to have levied contributions on the ports visited, and destroyed shipping as follows:—

RODNEY, WARSPITE, IRIS, AND SEVERN.

Admiral's claims. *Aberdeen.*—£400,000, and all shipping destroyed. Return of shipping not given. Approximate time, thirty minutes.

Firth of Forth.—Edinburgh, £1,000,000; Forth Bridge destroyed; 3000 tons of coal provided for his squadron; live-stock and vegetables requisitioned, and all shipping in Leith Roads destroyed.

Iris remained at Leith seven hours, during which time the shipping, not being numerous, might have been destroyed.

As, for the purposes of these manœuvres, the Forth was not a "fortified port," any resistance which might have been offered to the passage of the squadron past Inchkeith and Kinghorn Ness is not taken into consideration.

RODNEY.

The Tyne.—£500,000 levied on Shields, £1,000,000 on Newcastle, and fire opened on Newcastle at 16,500 yards (8¼ miles), from Rodney's 69-ton guns; also all shipping destroyed in the river. No returns furnished. Time occupied, 1 hour 5 minutes.

Sunderland.—£1,000,000 levied, and all shipping destroyed. Returns of shipping not given. Time occupied, about half-an-hour.

SEVERN.

Hartlepool.—£500,000 levied, and shipping (two steamers) destroyed by gun-fire. Time occupied, 1 hour 25 minutes.

Scarborough.—£500,000 levied, two steamers and a camp destroyed. Time occupied, 40 minutes.

During the passage between Hartlepool and Scarborough, in three

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hours, 13 steamers under weigh, and a fishing-fleet, were destroyed by the Severn. The crews were not removed.

WARSPITE.

Grimsby.—£500,000 levied; 31 steamers, and 26 sailing vessels destroyed.

From the time this vessel parted from the Flag off Inchkeith, at 4.15 P.M., on the 7th August, until she reached the appointed rendezvous on the 8th at 10 P.M., she never appears to have gone less than 12 knots in any one hour. She steamed 2 miles up the Humber on the morning of the 8th, firing on the shipping, then altered course 16 points to starboard, and proceeded to sea again.

Thus, in about thirty minutes, and at a speed of 12 knots, this vessel claims to have requisitioned Grimsby and sank shipping in the Humber, as stated above, and altogether during her thirty hours absence from the Flag, at an average speed of 13 knots, to have destroyed 56,570 tons of shipping, including 45 steamers and 53 sailing-vessels, besides small craft.

Opinion.

Whilst it is clear that the destruction claimed to have been effected in the course of these raids is, to some extent, fanciful as regards the time in which such result could be accomplished, it is unnecessary to point out the incalculable mischief which so enterprising an enemy might inflict in even that short time, and how imperative it is to complete the military defences of our great commercial centres without further delay.

NOTE.—It is to be observed that, in the execution of this service, the Rear-Admiral acted in accordance with the orders of his Commander-in-Chief—"to destroy, not capture," yet, in the case of every vessel destroyed at sea, it would have been necessary to allow the time required to transfer the crew, which, from one cause or another, could hardly be less than one hour for every vessel claimed by each ship, nor is it probable that all steamers in sight would remain to be captured instead of spreading in every direction at their utmost speed.

Capture of Liverpool.

Of the capture of Liverpool on the 9th August, which has already been referred to in this report, little more need be said. Under the rules the port was undefended, and so fell an easy prey; one of the British ironclads—the Belleisle—which was there coaling was also captured, although she would doubtless have given a good account of the enemy's cruisers and torpedo-boats which were sent in ahead of the ironclads, and which were unaware of her presence in the river. Further remarks on this subject will be found under the heading "Claims for Capture, &c."

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Defences of Liverpool.

It should, however, be taken into consideration that the present defences of Liverpool consist of—

Seaforth Battery	4 12·5-in. R.M.L. guns	
Perch Rock	8 64-pr.	„
	1 7-in. R.B.L. gun	
	Besides smaller guns	

in addition to a mine defence, which would certainly have been put in position at the commencement of hostilities; the Belleisle also could have been used as a valuable adjunct to these defences.

Defences of Liverpool insufficient.

Opportunity is taken here of calling serious attention to the fact that the military defences of Liverpool are by no means as complete as they should be.

Holyhead.

At Holyhead, on the 11th August, the shipping was attacked, and a British torpedo-boat, No. 66, found there, was "destroyed."

Exmouth. Bridport.

Exmouth and Bridport were visited by the Iris and Severn on the 19th August, and both towns being undefended, would certainly have been exposed to much damage.

Shipping in Portland Roads.

But with regard to the reputed attack on the shipping in Portland Roads by the Iris in West Bay (the Severn was not with her at the time), the Committee consider that Rule I., "Defended Ports," was infringed by this action. Two 12·5-inch guns in Verne Fort cover the east end of West Bay, and an enemy's cruiser coming within range of them, as would be necessary in order to shell the shipping inside over the Chesil Beach, would undoubtedly run grave risk of damage, if not of total destruction.

In considering the depredations claimed to have been thus committed at unprotected commercial ports by single cruisers such as the Spider and Amphion, it has to be borne in mind that the available armoured coast defence ships—six in number—and the thirty-three Rendel gunboats at the disposal of the Admiralty, were not brought into action for the purposes of these manœuvres, and that these vessels would prove a very important factor in the defences of the coast.

Inconstant.

This vessel was given up to the Admiral of the Achill Fleet in Lough Swilly, having been struck by a torpedo and necessarily seriously injured, if not sunk; but, three days after, she was cruizing under her British captain and crew against British commerce in the Atlantic.

She might have been recommissioned by a crew of Achilles, but she would scarcely have been fit to cruise in the Atlantic, under the circumstances, within a week.

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The following is a summary of the losses which, in the opinion of the Committee, were sustained by each side:—

"A's" Losses.		"B's" Losses.	
Torpedo-boat No. 50	August 3	Torpedo-boats—	
Archer	„ 3	No. 51	August 3
Inconstant	„ 3	No. 90 (late No. 50)	„ 3
Tartar	„ 4	No. 78	July 31
Arethusa	„ 5	Curlew	August 5
Belleisle	„ 9		
Torpedo-boat No. 66	„ 10		
Two torpedo-boats by fire of their own ships	July 24		
Vulture (collier)	„ 27		
Total.		Total.	
1 ironclad.		1 cruiser.	
4 cruisers.		3 torpedo-boats.	
4 torpedo-boats.			
1 collier.			

It is to be observed that in the whole course of these manœuvres the British Admiral was heavily handicapped as being thrown entirely upon his own resources.

Not only was he cut off from the central source of authentic information—the Admiralty itself—which would not have been the case in war, but, as is mentioned under another head, the coast defence vessels, to which he could have reasonably looked for the protection against attack by single cruisers of coast towns, with imperfect military defence or no defence at all, were not utilized.

Again, under the rules, the only "defended ports" were Pembroke, Plymouth, Portland, Spithead, and the Medway.

So that Liverpool, and the Forth, which happen to have some guns mounted in their batteries, and are provided with a mine defence, were theoretically helpless.

On the other hand, the Admiral was relieved of the onerous duty of watching the west coast of Ireland.

The British fleet also had no record of brilliant successes to place against the achievements of their enemy, as Achill was a state possessed of no floating commerce, and the British Admiral spared its capital and the towns on its littoral.

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As to—"The defects of importance which were developed in any of the vessels employed, and their cause."

Of the defects developed, particulars of which have been laid before the Committee, by far the greater number are of an unimportant character, and are for the most part due to the fact that many of the vessels were newly commissioned and altogether untried, several of them not having entirely completed their contractor's trials, and that the engine-room staff were in most cases absolute strangers to the vessels into which they were drafted for the purposes of these Manœuvres.

In the opinion of the Committee, only ten of these defects are of importance, and these will be found in the accompanying Table, together with the Committee's remarks as to their cause, based upon such information as they have been able to obtain:—

DEFECTS OF IMPORTANCE DEVELOPED DURING THE MANŒUVRES, AND THEIR CAUSE.

Ship.	Nature of Defect.	Time disabled.	Opinion of the Committee as to the Cause of the Defect.
Rodney	Glands required repacking	(1.) 2 hours 20 minutes .. (2.) 2 hours 30 minutes ..	The ordinary 'Tuck's' packing had been fitted in this ship. The Committee understand that it has since been approved to use metallic packing.
Benbow	Air-compressing machinery, for Whitehead torpedoes, inefficient and insufficient for its work	.. ..	It is understood that this is due to defective construction, and that the contractors by whom this machinery was supplied have not been recently invited to tender in consequence of unsatisfactory reports received respecting the working of their machines.
Warspite	Crowns of furnaces came down ..	.. ..	This has been made the subject of a Court of Inquiry, with the result of which the Committee have not been made acquainted.
Northampton ..	Steam steering gear continually giving out, rendering ship unmanageable. Steam capstan invariably breaks down whilst weighing	.. ..	These defects are both purely Dockyard questions, which would require special investigation.

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Severn	Cover of air-pump defective	4½ hours, while at rendezvous	No report of this circumstance has been received at the Admiralty. It does not appear to have been serious.
Mersey	Leaky tube-ends. Tubes leaky and salted	A considerable time. Boilers were disabled for varying times from 35 to 66 hours	Caused by the undue use of sea water in boilers, combined with working for several hours at high pressure. The Committee are informed that double-distillers have been ordered for this ship (and for Curlew), and that they are to be fitted at once. It is expected that this will remedy the defect.
Serpent	Valves and steam pipes leaky . ..	.. ..	The machinery of this vessel (and of her sister ship Racoon) is still under trial, not having been taken over by the Admiralty from the contractors.
Mohawk	Boiler-tubes choked and leaky ..	Several days	The Committee are informed that this vessel is fitted with Weir's evaporators, which did not work efficiently, but primed, and supplied salt instead of fresh water to the boilers. They are also entirely new fittings, and little or no previous experience as to working had been obtained. Since the manœuvres various modifications have been made in these machines, which, according to information, has made them efficient both as regards the quantity and purity of the water produced.
Grasshopper.. ..	Exhaust pipe of main-feed donkey broken at flange, &c.	30 hours	Due to excessive vibration. The Committee are informed that this vessel is to be strengthened by a system of struts and brackets, as in the case of Spider, which alteration, it is expected, will remedy this defect.
Torpedo-boats generally	Fresh water arrangements very unsatisfactory	.. ..	It is understood all boats are fitted with double distillers. It is not considered desirable that they should carry more fresh water, which would cause a reduction in their speed. The Committee are informed that Yarrow has proposed to provide a simple apparatus for boilers—a description of evaporator. Improved fittings are, they are told, being supplied to existing boats.

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Remarks as to Personnel.

The result of these operations as regards the personnel of the navy is one with which England has every reason to be satisfied; it shows that the fine qualities of professional knowledge, energy, skill, and devotion to duty are as present as ever, and that, so far as their numbers go, the officers and men of the British navy may be depended upon to do their duty, when the time of trial comes, in a manner consonant with its best traditions.

Now equal to best traditions.

Arduous nature of the work.

The hard and trying work required from the officers and men of the blockading squadron during a fortnight of incessant movement, calling for the exercise of the utmost vigilance, especially at night, was performed in a manner deserving the highest praise, and it is no small result that this duty was discharged from the time of the establishing of the blockade until the close of the operations without the occurrence of any single accident worth recording, though, to perform it effectively, many risks had necessarily to be run.

Strain on blockaders.

It was not known to any but the Admirals of the blockaded force that the attempt to break the blockade would not be made before the night of the 3rd August, so that the strain upon the blockaders was never relaxed.

In this respect the blockaded squadrons had the advantage, as they would have had in real war, for the Admirals had it in their option to husband their resources, especially in coals, and in sparing their personnel night work at will. The work of harassing the enemy outside was, nevertheless, fully kept alive from first to last.

Officers and men strange to their ships.

The officers and men in many of the vessels employed on these services were entire strangers to the ships they were appointed to, some of which had not even passed their final contractors' trials, and it is no small merit that they were so well handled under such circumstances.

Engineering staff.

The services of the engineer officers in charge of the machinery, and of the engine-room staff of these new ships, seem to call for special commendation.

The reports from the Admirals on both sides engaged in the recent operations, relative to the share taken by the torpedo-boats, are most satisfactory as regards the work done by officers and men, and fully show what services may be expected from the lieutenants and junior officers of the fleet when the time of trial of their high qualities is brought to the test of war. The narrative of Lieutenant Henry B. Jackson, commanding the torpedo flotilla off Berehaven, is specially interesting and deserving of notice.

Work in torpedo-boats.

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Miscellaneous Remarks.

Employment of Deck Hands in Stoke-holds.

We would call attention to the fact of the large amount of deck hands employed in the stoke-holds of many of the ships engaged in the late manœuvres, which would point to a deficiency either in the complement, the quality of the stoker, or to inexperience; and from what came under our own personal observation as Commanders-in-Chief on foreign stations, when ships were recommissioned abroad, we are inclined to attribute it to inexperience, as there was no doubt as to the great improvement in the stoking after a few months' practice.

It is unnecessary to go into details; they are fully given in the reports of the Admirals commanding the respective squadrons.

The Warspite is the strongest case. When breaking the blockade on the 3rd August at 16 knots speed, thirty-six deck hands were sent to assist in the stoke-holds at a time when in real war every man would be required at his station for battle. Warspite.

Harbour of Refuge at Filey.

The question of employment of convict labour (on the completion of the extension works in the Royal Dockyards) in the construction of harbours of refuge has been the subject of discussion for many years.

The Committee desire to express their opinion that such labour, when available, could not be more advantageously employed than in the construction of a harbour at Filey, which would, in the event of war, prove a strategical centre of the first importance in the North Sea.

Flag of Truce (irregular use of).

The Committee think it right to call attention to the irregular use of a flag of truce by the ships of B squadron.

Once, when No. 50 torpedo-boat—a prize to the Calypso—displayed it without authority for the purpose of facilitating her running the blockade of Lough Swilly by its means.

Secondly, by the Curlew, which hoisted a flag of truce when carrying a despatch from the Admiral of B^2 to the Admiral of A^2. The former had left Lough Swilly in the Rodney on the previous night; but, in order to deceive the enemy, his flag was hoisted on board the Black Prince—a perfectly legitimate *ruse*—but it appears irregular to use a flag of truce under such circumstances.

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The Committee fully concur with the remarks made by the Admiral of A² squadron, viz., "that no taint of suspicion should attach to official communications passing between officers, even in the position of belligerents," under cover of a flag of truce.

Naval Officers on Retired List, &c., writing in the Newspapers.

The Committee also wish to call the attention of their Lordships to the habit of naval officers on half-pay or the retired list, who have been permitted to take passage in ships of the squadron, taking advantage of their position and authority as naval officers to write in the public journals criticizing the manœuvres. It is well known that no person attached to a particular corps or ship can give a correct account of operations as a whole, only a limited part of which can come under their own view. Their accounts are necessarily incorrect, misleading to the public, most unjust to those conducting the manœuvres, and injurious to the service.

We think that officers who are guests on board Her Majesty's ships on these occasions should be placed under the same restrictions as those on full pay with reference to communications with public journals, &c.

(Signed) W. M. DOWELL, *Admiral.*
R. VESEY HAMILTON, *Admiral.*
FREDK. W. RICHARDS, *Vice-Admiral.*

CHAS. W. DICKINSON, *Secretary.*

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SUPPLEMENTARY REPORT OF THE COMMITTEE ON THE NAVAL MANŒUVRES.

SUPPLEMENTARY INSTRUCTIONS.

6th December, 1888.

SIR,—I am to acknowledge the receipt of the Report of the Committee appointed to inquire into all the circumstances connected with the late Naval Manœuvres, as contained in the reports received from the Admirals in command of the squadrons engaged.

2. My Lords desire to express to you, as Chairman, and to request that you will convey to Admiral Sir Richard Vesey Hamilton, K.C.B., and Vice-Admiral Sir Frederick Wm. Richards, K.C.B., their Lordships' thanks for the report.

3. My Lords will be glad if the Committee will supplement their previous report by favouring their Lordships with their opinion on the two following points :—

I. On the behaviour and sea-going qualities of, or the defects in, the new and most recently commissioned vessels as obtained from the reports of the Admirals in command of the respective squadrons.

II. The general conclusions to be drawn from the recent operations.

I am, Sir,
Your obedient Servant,
(Signed) EVAN MACGREGOR.

To Admiral
SIR WM. DOWELL, K.C.B.

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Opinions on the Behaviour and Sea-going Qualities of, or the Defects in, the New and Most Recently Commissioned Vessels, as obtained from the Reports of the Admirals in Command of the Respective Squadrons.

Sea-going Qualities, &c.

Whether experienced.

No weather appears to have been experienced by any of the vessels engaged in the recent manœuvres which afforded opportunities to either the flag officers or the captains in command of judging as to their behaviour or sea-going qualities under conditions of either strong wind or heavy sea. The Committee feel, therefore, in the reports from these officers, they have not sufficient data wherewith to give a decided opinion on these points, especially in the case of the large ironclads and cruisers.

We have, however, carefully read and considered all the papers above referred to, and, from the information obtained therefrom, report as follows:—

Rodney—Benbow—Collingwood.

So far as could be judged, these vessels are good sea-boats, and their speed is not affected when steaming against a moderate wind and sea; but we are of opinion that their low freeboard renders them unsuitable as sea-going armour-clads for general service with the fleet, as their speed must be rapidly reduced when it is necessary to force them against a head sea or swell.

Unsuitable as sea-going iron-clads.

On the only occasion on which the Collingwood experienced any considerable beam swell she is reported to have rolled 20° each way; this does not make it appear as if the Admiral class will be very steady gun-platforms in bad weather.

They are said to be "handy" at 6 knots and over.

Benbow. Defective fittings of bower anchors.

In the Benbow much difficulty was experienced in stowing the bower anchors. This is the case in all low freeboard vessels, more or less, but the evil appears to have been intensified in this instance by defective fittings, and by the fact of her being supplied with the old-fashioned iron-stocked anchors instead of improved Martin's.

Serious complaints are made from these ships that the forecastles leak badly, and that the mess deck is made uninhabitable whenever the sea breaks over the forecastle at all; it would seem that this defect might be remedied.

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CONQUEROR—HERO.

It is reported of both these vessels that they may be expected to roll a good deal, but the motion is easy, and they do not "hang" at the end of the roll.

From the small amount of experience obtained, it is considered that their speed would not be much affected by wind, but, being short, they feel a head sea quickly, and, on account of their low freeboard, it would be impossible to "drive" them against a heavy sea or swell at anything approaching full speed.

Admiral Tryon in his report, dated 28th August, draws an unfavourable comparison between the speed of these shorter vessels of great beam—however fast they may be in smooth water—and that of the long ships of an older type, under the conditions of heavy wind and sea.

It is said that they get rid of the water forward very quickly, and rise easily after every plunge.

In spite of their admittedly lively motion, the captains of both these vessels consider them steady gun-platforms. Admiral Baird, however, does not concur in this opinion as regards the Conqueror; Admiral Tryon reports that "there was no occasion when, in the opinion of her captain, the guns of Hero could not have been "fought efficiently"—but then the opportunities of judging this were small.

Both ships are reported as being very "handy," to steer well, and to answer the helm quickly.

Hero's captain is of opinion that the screw shafts have too much "spring" in the vicinity of the main thrust bearings, and that the hull wants strengthening there.

Much inconvenience and discomfort was experienced in both vessels from the heat and smoke of the ship's-company's galley when the ship is battened down, and the captains are of opinion that this fitting should be removed into the "superstructure"—in this suggestion the Committee concur.

It is considered that the turret guns in this type of ship are too close to the deck, and that the explosion from them is likely to seriously damage the upper-deck fittings in their line of fire; as it is now, all the fittings on the fore-deck leak badly, and the mess-deck is always "afloat" when steaming against a moderate sea. A trial of the strength of these fittings should be made by firing full charges "right ahead."

No protected

There is no protected stern fire in this type, and the late captains

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guns having stern fire.

of both these vessels call serious attention to the want of it. This defect should be borne in mind in the construction of future battleships of this type.

MERSEY.—SEVERN.—THAMES.

So far as experience was obtained during the recent manœuvres, these vessels proved themselves good sea-boats; they are reported to be "handy," to have steady gun-platforms, and that they could fight their guns "longer than most ships."

Armament.

With regard to their armament, the late captain of the Severn considers that the 8-inch B. L. guns on the poop and forecastle should be removed, and their places taken by lighter guns; Admiral Baird is of opinion that "the cruiser class especially are too heavily armed."

The "small dynamo" seems to be deficient in power, and it is reported that candles had to be resorted to for internal lighting whenever both search lights had to be used at the same time.

No important defects appear to have been developed in any of these vessels, but many suggestions are made for improvements in working details, which will, no doubt, be dealt with by the Controller in due course.

ARETHUSA.

Although the sea-going qualities, &c., of vessels of this type must, from the reports of Leander and Phaeton, be well known, the Committee think it right to call special attention to certain remarks contained in the report of the captain who lately commanded this ship.

He considers the Arethusa a good sea-boat, and that she steams well against a moderate head sea and strong wind, but that she rolls heavily when the sea is abeam or abaft; she is therefore unsteady as a gun-platform under these conditions, and, on account of her quick and heavy rolling, "accurate shooting would be an impossibility, and machine guns in the tops would be useless."

Among the many suggestions made for improving her efficiency, the following refer especially to the reduction of top weight:—

(*a*) Removal of square rig on foremast.

(*b*) Removal of the fighting tops.

The captain does not himself suggest that the armament should be lightened; but Admiral Baird's opinion, that all cruisers appear to be too heavily armed, applies to this vessel as well as to the Mersey class, and in this opinion the Committee concur.

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Three other suggestions from the same officer are noted as specially worthy of consideration, viz. :—

To enlarge the rudder.

To extend the upper bridge out to the ship's side in order to obtain a view right aft.

To fit a search light on the poop, as a torpedo-boat coming up astern cannot be kept in the beam of the ones on the fore-bridge.

Archer Class.

Six of this type were employed during the manœuvres. The officers lately in command of these vessels report that, from the limited experience gained as to their behaviour and sea-going qualities, they appear to be good sea-boats, but would not keep up their speed in a head sea, and, owing to the great weight in the bows, they pitch heavily.

They are quick rollers, and consequently unsteady gun-platforms.

They are all handy vessels.

Armament too heavy.

It is reported, unanimously, that the armament is too heavy, and consequently the vessels are "crank," that the weights on the forecastle are too great, and the forecastle itself is not strong enough for the weight it has to bear; of the Racoon, the only vessel of the class which appears to have experienced anything like a heavy sea, it is reported that on one occasion, when going 10 or 11 knots against a moderate swell, a sea was taken on board which carried away everything movable on the forecastle, broke in the fore-hatch, which was battened down, tore away the iron stanchions supporting the forecastle, and bent the beams down 3 inches.

Racoon.

It would seem that the weights forward are too great for vessels with such fine lines, and this naturally causes them to pitch heavily. The bower anchors appear to be stowed unnecessarily far forward, and the spare anchor is before them again (on the port side); each anchor weighs 40 cwt., and the cat davits 25 cwt. each; the two 6-inch guns, with their mountings, weigh a little over 25½ tons. Thus over 34 tons of dead weight are carried on the forecastle.

Committee's suggestions.

The Committee are of opinion that much of this weight "in the eyes" of the ship should be reduced, and suggest that the "bowers" should be stowed farther aft, the spare anchor removed to a position near the mainmast, and that the two 6-inch guns on the forecastle should be replaced by 5-inch, by which latter means alone a saving of over 15 tons would be effected.

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They submit also that the proposal to substitute 5-inch for 6-inch guns throughout is, in view of the "crank" nature of these vessels, as reported by their late captains, worthy of the most serious consideration.

Rattlesnake Class.

For the purposes of this Report all four of the "torpedo-gunboats" employed in the recent operations may be considered as belonging to the same type.

From the reports of the officers who lately commanded them, it may be assumed that, for the purpose for which they were designed, they are satisfactory sea-boats, and, "provided they are handled with care," are safe vessels.

Satisfactory sea-boats.

Under all circumstances of heavy weather they seem to be extremely lively, and to "ship" a good deal of water, except when steaming *easy* against the sea, or running at speed before it.

Their behaviour is said to be much the same as that of a large torpedo-boat, their light draught making it difficult to steer a steady course when there is anything approaching to a heavy sea on.

The gun-platform is, as may have been expected, an unsteady one except when nearly calm, and it is on all sides reported that the 4-inch gun could not be fought in a sea-way.

As to their handiness, the reports are unfavourable on the whole. They only answer the helm quickly when steaming at speed, and their turning circle is large. Considering their great length and light draught, this is no more than was to be expected.

The removal of the 4-inch gun is strongly recommended by each of these lieutenant-commanders, and various suggestions are made for improving the general efficiency of their vessels.

We observe that the 4·7-inch quick-firing gun has been appropriated for both the Rattlesnake and the Grasshopper, and we would call attention to the fact that this change will entail an increase of weight—for guns, fittings, and ammunition—of 8½ tons over that at present carried for the 4-inch B. L., which increase, in view of the size and dimensions of these vessels, would appear to be excessive.

Committee's views.

With regard to the numerous other suggestions made, the Committee feel sure that each will be duly considered by the Controller, and that further trials will be made. These proposals which appear to merit immediate consideration are:—(1) To generally strengthen the hull in this type of vessel; (2) to raise the freeboard forward; and (3) to "turtle-back" the forecastle.

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In this brief Report, only the more important defects have been noticed, and only such of the suggestions made by the various reporting officers as, in our opinion, deal with questions of principle are touched upon.

Many other points, of greater or less importance, have been raised in these reports, and, as experience of new types of ships is not easy to obtain, we strongly recommend that one and all of these proposals should receive the fullest consideration.

Sufficiency and Efficiency of Engine-room and Signal Staffs.

Too many untrained men.

The proportion of untrained (2nd Class) stokers which were draughted to several of the ships appears to have been too large; in point of physique they are reported as unequal to their work, and in many instances the experience of these men in stokehold (or any other work on board ship) was nil.

Attention to this want of experience on the part of stokers in newly commissioned ships was called in paragraph 1 ("Miscellaneous Remarks"), page 23 of the Committee's Report, dated 21st November, 1888.

The late captain of the Mersey, in his letter dated 13th August, points out the great want of trained stokers which was felt in that ship, and the consequent strain on the whole engine-room staff; in all types of vessels this want seems to have been experienced, as the accompanying Table (Table A), compiled from the reports before us will show.

As a means for affording opportunities for training newly raised stokers, we recommend that at least one year should be served by them as supernumerary in a sea-going ship before they are considered fit to be draughted as part complement to any vessel; we further are of opinion that a Committee should be appointed to inquire into the sufficiency, or otherwise, of the complements allowed in the steam department of each class of ship, the proportion of 2nd Class stokers which should be borne, and the amount of training which they should be required to undergo before they can usefully be borne as part complement in a fighting ship.

Appointment of a Committee recommended.

Signalmen.

It is understood that the *personnel* of the signals department has received the attention of various committees lately, and it is hoped that the outcome of their recommendation may result in a speedy improvement of the same, both as regards numbers and efficient training.

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TABLE A.

Name of Ship.	Opinions of Captain as to the State of Engine Room Staff.
Benbow	2nd Class Stokers lack experience and "physique," require constant help from deck.
Collingwood	Requires 1 Engineer Officer, 2 Engine Room Artificers, 4 Leading Stokers, and 10 Stokers in addition.
Conqueror	Requires 10 more Stokers.
Mersey	Wants 1 Assistant Engineer and 12 Stokers in addition to present complement.
Thames	An increase of 1 Engine Room Artificer, 1 Leading Stoker, and 10 Stokers (*not* 2nd Class) required.
Arethusa	Engine Room complement insufficient by 2 Engine Room Artificers, 2 Leading Stokers, and 23 Stokers.
Mercury	The number of 2nd Class Stokers should never exceed 10. Complement generally cut down too fine.
Archer	Proportion of Stokers, 2nd Class, is too high.
Mohawk } Tartar }	10 more Stokers are required.
Racoon	Engine Room Complement is insufficient, and inefficient in quality.
Grasshopper	All Stokers carried in vessels of this type should be thoroughly trained.

II.—DIGEST OF CONCLUDING SECTION OF THE REPORT OF THE COMMITTEE ON THE LATE NAVAL MANŒUVRES, DATED 21ST NOVEMBER, 1888.

GENERAL SUMMARY.

Main lesson.

The main lesson which these manœuvres emphasize is that Great Britain, whose maritime supremacy is her life, is very far from being as strong as she should be on the seas, either in *personnel* or *matériel*.

That the two squadrons, A and B, which were assembled to take part in these manœuvres represented the then entire naval force available at home for the general purposes of war—*i.e.*, for reinforcing our squadrons in the Mediterranean and on distant stations, for maintaining our necessary superiority in the Channel, as well as the considerable light squadrons which would undoubtedly be required on the coast of Ireland, and for the protection of our merchant fleets approaching and leaving our shores.

Channel Fleet.

That the Channel Fleet (so called) should, supposing the enemy to be a great maritime power, be of sufficient force to blockade the fleets of such power in their ports, or to bring them to immediate action should they put to sea; and that there should always be an effective reserve squadron, absolutely confined to home waters, sufficient to

Effective reserve squadron.

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hold the Channel and protect the coasts and commerce of the United Kingdom, in addition to the district (coast defence) ships which would be necessary for active local defence on the coasts of Great Britain, Ireland, and the Channel Islands, and that there should then remain available a sufficiency of battle-ships and swift cruisers to reinforce our squadrons abroad to the necessary point of superiority with reference to the requirements of each station, for the formation of detached squadrons, and convoys for commerce and troops, over and above the number required for home and Mediterranean service and an ample reserve to meet the waste of war.

For all these services in July last the total number of battle-ships and cruisers, &c., available in home waters, was as follows:—

Armoured ..	Battle-ships	19
	Cruisers, 1st Class	3
Unarmoured	Do., 2nd and 3rd Class ..	18
	Gun-vessels, &c.	1
	Torpedo vessels	4

a force altogether inadequate, in our judgment, to meet the requirements we have indicated,* and to *take the offensive* in a war with only one great power, and, supposing a combination of even two powers to be allied as her enemies, the balance of maritime strength would be seriously against England.

Torpedo flotilla.

On comparing the torpedo flotilla of England with those of other great powers, we are of opinion that in this respect also this country is not as strong as it should be.

Repairing the older iron boats.

As a measure most ready to hand for increasing our reserve of battle-ships, without prejudice to the completion of the new vessels not yet ready, we strongly advocate the desirability of bringing forward such ships as the Achilles, Warrior, Hector, Superb, Defence, Valiant, and Minotaur into such a condition of efficiency as will at all events render them available as a reserve Channel squadron in case of sudden emergency. They are all iron ships, well subdivided into compartments, fairly protected against shell-fire, and are more than a match for many battle-ships which could be brought against them.

Ships should be re-engined and re-boilered.

Until such time, therefore, as the places of these vessels can be fully supplied by better, we deprecate their being allowed to go into disrepair. They are, in our opinion, for the most part capable of doing good service for many years to come, and when it is taken into consideration, supposing their hulls to be in good order, that all the ships

* The Mediterranean Squadron alone, consisting of seven battle-ships, one torpedo ram, four cruisers and eight smaller vessels, would have required to be more than doubled.

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we have named could be re-engined and re-boilered for about the cost of one new vessel, it appears to us to be most desirable that they should be made available to meet emergencies, and that so inexpensive a means of rapidly increasing our ironclad fleets should be made use of, but we distinctly desire to guard ourselves against giving an opinion that the building of new ironclads should not be proceeded with, irrespective of these vessels.

Re-commissioning at foreign ports.

Your Committee are strongly of opinion that the system which has obtained since 1868 of re-commissioning ships abroad over and over again has, in a great measure, brought about a dearth of reserves. It is, no doubt, an economical arrangement, and, from that point of view, has its advantages in peace time, but its effect, in the respect we have above indicated, has, in our opinion, been distinctly pernicious.

In considering these points, we have not noticed at all the vessels building and completing, as no ship should be taken credit for until she is in all respects ready to "go to sea and fight."

We note, however, the large number of good vessels which are in course of construction at the present time, and which, by the year 1890–91, will considerably improve the position of England, especially in cruisers; but no fresh ironclads appear to have been laid down since the year 1886, and as there is nothing in our opinion to justify the belief that the days of ironclad battle-ships are over, we recommend a resumption and a steady continuance of ironclad building.

Recommend the continuance of ironclad ship-building.

If England could "consistently with national honour" control the question of peace or war there would be no need for haste in bringing up her naval force to the standard required for insuring, under providence, a successful issue to a struggle for the freedom of the seas; but, as there seems nothing to support the belief that she would have any option in the matter, when it suited another great power to challenge her maritime position, we are decidedly of opinion that no time should be lost in placing her Navy beyond comparison with that of any two powers.

No time to be lost in making Navy efficient.

Without particularising her possible antagonist, there can be no doubt but that, were England involved in a maritime war, and she were to resume her natural rights as a belligerent—which appear to have been voluntarily laid aside by the declaration of Paris in 1856—complications with neutral states would inevitably ensue, and her whole commercial position, and the immense carrying trade by which it is sustained, would be jeopardized at the outset were war to be forced upon her at a time when her Navy was weak.

Effect of war on our commerce if the Navy be weak.

No other nation has any such interest in the maintenance of an

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undoubted superiority at sea as has England whose sea-board is her frontier.

England's seaboard her frontier.

England ranks among the great powers of the world by virtue of the naval position she has acquired in the past, and which has never been seriously challenged since the close of the last great war.

The defeat of her Navy means to her the loss of India and her colonies, and of her place among the nations.

What the defeat of England's Navy would mean.

Without any desire to question the sums annually granted by Parliament for the maintenance of the services, we cannot but note the disproportion in the appropriation when the magnitude of the issues involved is taken into consideration.

Parliamentary votes insufficient.

It would, in our opinion, be far more in consonance with the requirements of the nation by the provision of an adequate fleet to render invasion an impossibility than to enter into costly arrangements to meet an enemy on our shores (instead of destroying his "Armadas" off our shores), for under the conditions in which it would be possible for a great power to successfully invade England, nothing could avail her, as, the command of the sea once being lost, it would not require the landing of a single man upon her shores to bring her to an ignominious capitulation, for by her Navy she must stand or fall.

We should have such a fleet as would render invasion impossible.

The consequence of the loss of command of the sea.

(Signed) W. M. Dowell, *Admiral.*
R. Vesey Hamilton, *Admiral.*
Fredk. W. Richards, *Vice-Admiral.*
Chas. W. Dickinson, *Secretary.*

Observations by Admiral Sir Arthur Hood on the Supplementary Report of the Committee on the Naval Manœuvres of 1888.

I.—Opinions on the behaviour and sea-going qualities of, or the defects in, the new and most recently-commissioned vessels, as obtained from the reports of the Admirals in command of the respective squadrons.

Rodney—Benbow—Collingwood.

The Committee are of opinion "that the low freeboard of these vessels renders them unsuitable as sea-going armour-clads for general service with the fleet, as their speed must be rapidly reduced when it is necessary to force them against a head sea or swell."

I cannot concur in this opinion, my view being that the objects of

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Does not agree with the Committee.

primary importance to be fulfilled in a first-class battle-ship, are, (1) that, on a given displacement, the combined powers of offence and defence shall be as great as can be given; (2) that she shall be handy, and possess good speed in ordinary weather, combined with sea-worthiness; (3) that she shall have large coal-carrying capacity. I cer-

Admiral class.

tainly do not consider that the Admiral class which, on account of their comparatively low freeboard forward, must have their speed reduced when steaming against a heavy head sea or swell, to a greater extent than is the case with the long high freeboard, older armour-clads, as the

Minotaur.

Minotaur, Northumberland, Black Prince, are for this reason rendered unsuitable as sea-going armour-clads for general service with a fleet.

Not necessary to force a battle-ship in heavy sea as it is in a cruiser.

The power of being able to force a first-class battle-ship at full speed against a head sea is not, in my opinion, a point of the first importance, although, in the case of a fast cruiser, it certainly is. Admiral Tryon draws an unfavourable comparison between the speed of the new battle-ships, and that of the long ships of the old type, when steaming against a head sea. I admit at once that vessels like

Argument.

the Minotaur class would maintain their speed and make better weather of it when being forced against a head sea, than would the Admirals; but this advantage, under these exceptional conditions, cannot for a moment be compared with the enormous increase in the power of offence and defence possessed by the Admirals. When the

Thin armour.

older type of armour-clad vessels were designed, the thickness of armour required to give protection against the guns of that date was very small, and it was quite possible to have long ships with high freeboards, protected all over with thin armour, and armed with a large

Thick armour.

number of guns of moderate weight; now, however, it has become absolutely necessary to protect the vital parts of battle-ships with the thickest armour that can be carried, and to arm them with the heaviest guns, protected by very thick armour; and in order to enable this to be done without building vessels of an enormous size, it became necessary to reduce as much as possible the area to be protected, and the weight of hull, hence the adoption of low freeboard, with light

Opinion of the Admiral class.

superstructures and unarmoured ends. The Admiral class, which embody these features, are powerful battle-ships (although in my opinion they possess certain undesirable points with regard to power of defence), and cannot, I consider, be termed unsuitable as sea-going armour-clads for general service with the fleet, merely on account of their low freeboard.

With regard to the difficulty of stowing the anchors of the Benbow, this has been fully considered, and orders have been given to supply Martin's anchors to her, which will remedy this defect.

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The leaking of the fore deck in the low freeboard vessels, which was generally complained of during the manœuvres, has been fully considered, and will be remedied.

Conqueror—Hero.

My foregoing observations apply also to this type, and I will, therefore, not recapitulate. I consider them to be powerful second-class battle-ships, possessing good powers of offence and defence, good speed and handiness.

Mersey Class.

I am decidedly opposed to reducing the armament of this class by the substitution of lighter guns for the bow and stern 8-inch guns.

Arethusa Class.

The proposal to remove the square rig on the foremast, and the fighting tops, in order to reduce top weight I do not concur in; the square rig on the foremast is a decided advantage to vessels of this class, and would enable them to save coal when cruising on a foreign station; the value of the guns mounted in the fighting tops would be considerable when engaged with cruisers, and therefore I would retain them.

Archer Class.

I quite concur in the view that these vessels are too heavily weighted forward, and should have preferred the substitution of 5-inch guns for 6-inch, one pilot-house instead of two, and the anchors, especially the sheet anchor, stowed further aft: they are handy vessels with very fair speed, and will be useful on foreign stations. The Porpoise, of this class, made a good passage to China, and I have heard no complaints about her since she has been on that station.

Rattlesnake Class.

It is stated that these vessels are satisfactory sea-boats and safe vessels, provided that they are carefully handled. It is stated that the 4-inch gun forward could not be fought in a sea way, but these vessels will not always be in bad weather, and there can be no doubt that, in moderate weather, when chasing, this gun would be of considerable value; the proposals made with regard to the improvement of this class are embodied in the Sharpshooter class.

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SUFFICIENCY AND EFFICIENCY OF ENGINE ROOM AND SIGNAL STAFFS.

It is stated that the proportion of untrained (2nd Class) stokers, which were draughted to several of the ships, appears to have been too large; that in point of physique they are reported to be unequal to their work, and that in many instances their experience was *nil*. As a matter of fact, a considerable increase had lately been made in the entry of 2nd Class stokers, who, consequently, had not had sufficient experience in their duties. A very heavy strain was brought upon the steam reserves to supply the very large number of stokers required for the whole of the vessels employed in the manœuvres, the result being that several 2nd Class stokers were necessarily sent in these ships who had not had sufficient experience in their duties; these men, during the manœuvres, had plenty of opportunity of learning their work in the stokeholds, and were, consequently, much more efficient when they returned to the reserves after the termination of the manœuvres. The physique of the 2nd Class stokers lately entered is not thoroughly satisfactory, and steps are being taken to endeavour to obtain a better result. With regard to the suggestion of the Committee, "that a Committee should be appointed to inquire into the sufficiency, or otherwise, of the complements allowed in the steam department of each class of vessels, the proportion of 2nd Class stokers, and the training they should undergo before being sent to sea, as part complement in a fighting ship," this, in my opinion, is quite unnecessary. The complement of the steam department in each class of vessel is approved, or otherwise, by the Engineer-in-Chief at the Admiralty, who must be a most competent authority; and any suggestion as to increase, which he considers to be necessary, is adopted. As to training the 2nd Class stokers, this I prefer to leave to the captains of Steam Reserve, and a proportion of these men are now employed in the Indian troop-ships as supernumeraries, in addition to the complement for training.

Strain on the steam reserves.

Committee unnecessary.

How engine-room complements are determined.

As to the Signal Staff, the alterations in the number and ratings of this class, and the addition which has lately been made to their pay will, I believe, produce a satisfactory result.

Signalmen.

OPINION OF THE COMMITTEE GIVEN IN THE GENERAL SUMMARY.

They state "that the two Squadrons A and B, which took part in the manœuvres represented the then entire naval force at home for the general purposes of war.

(2.) "That the Channel Fleet (so called) should, supposing the

Resumé of Com-

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enemy to be a great maritime Power, be of sufficient force to blockade the fleets of such Power in their ports, or to bring them to immediate action should they put to sea, and that there should always be an effective reserve squadron absolutely confined to home waters, sufficient to hold the Channel and protect the coasts and commerce of the United Kingdom, in addition to the coast defence ships which would be required for active local defence of the United Kingdom, and that there should then remain a sufficiency of battle-ships and fast cruisers to reinforce our squadrons to the necessary points of superiority with reference to the requirements of each station; for the formation of detached squadrons, and convoys for commerce and troops, over and above the number required for home and Mediterranean service; and also an ample reserve to meet the waste of war." The Committee then quote the total number of battle-ships and cruisers which were available in home waters, which they consider altogether inadequate to meet the requirements they have indicated.

mittee's views as to number of ships.

With regard to 1—the Committee have altogether omitted our armoured coast defence vessels, the thirty-three gunboats, and the thirty reserve torpedo-boats, which were not employed in the manœuvres, and which would certainly have been employed to assist in the protection of our coasts in the event of war.

Vessels left out of consideration by Committee.

II.—The programme sketched out with regard to the employment of our naval forces, if engaged in war with one great maritime Power, is of a *most* extensive nature. We are to be able to blockade the enemy in their ports, or bring them to immediate action should they leave them. (2.) A reserve squadron absolutely confined to home waters for the protection of the coasts and commerce of the United Kingdom, in addition to our coast defence vessels, which would be required for local defence. (3.) A sufficiency of battle-ships and cruisers to reinforce our squadrons abroad to the necessary point of superiority on each station, to form detached squadrons and convoys for commerce and troops. (5.) This to be over and above the number required for home and Mediterranean service, and an ample reserve to meet the waste of war. On this most extensive programme I would observe, that the movements of our squadrons, after a declaration of war, must depend to a great extent upon the action of the enemy after our squadrons had occupied the most desirable strategical positions as bases. It would be impossible to lay down as a rule, not to be departed from, that a reserve squadron should be absolutely confined to home waters, in addition to our coast defence vessels, as this must depend upon the action taken by the enemy. As to a

Committee's programme.

Sir A. Hood's observations thereon.

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sufficiency of battle-ships and cruisers being sent to reinforce our squadrons abroad to the necessary point of superiority, the Committee do not apparently take into consideration that on every foreign station, the Mediterranean (which may be considered almost in home waters) excepted, our squadrons are *far* stronger than those of any foreign Power; also, that, with regard to furnishing convoys for protection of commerce, the days of convoys are past, and, whilst at once admitting that our naval force is not of sufficient strength to perform efficiently the various services sketched out by the Committee in the case of war with one maritime nation, I believe it is of sufficient strength to engage the forces of any single maritime Power with success, to protect our coasts from the possibility of invasion, and to afford fair protection to our commerce abroad, and good protection to our commerce in the Channel and its vicinity, and I am certain that by the end of next year the strength of our Navy will be very largely increased, as compared with the advance which can be made by any other maritime Power in the same time.

Sir A. Hood's views as to commissioning ships abroad.

With regard to the opinion, strongly expressed by the Committee, "that the system of recommissioning ships abroad over and over again has in a great measure brought about a dearth of reserves, that it is doubtless an economical arrangement, but its effect has been distinctly pernicious," I cannot concur that this has had the effect they suppose; I do not approve myself of recommissioning vessels abroad, unless they have been carefully examined, and are reported to be in all respects fit for another commission; but, when they have been reported as thoroughly fit for another commission, I think it is desirable to recommission them instead of their returning home, being paid off, and probably repaired at a very large expense; in addition to this, one reason of late years for recommissioning vessels (especially corvettes and smaller vessels) abroad has been the want of suitable vessels to replace them.

A. W. A. Hood.

30*th December*, 1888.

Observations by Lord George Hamilton.

The Committee, in their clear and very valuable report, amongst other matters, lay great stress upon what they believe to be the insufficiency of naval strength in the home waters available for service in July last. Two causes which are not likely to occur again, and certainly not in combination, tended largely to reduce at that

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time our reserves in the dockyards. Three foreign flagships happened at the same time to be in process of relief, thus depriving the home reserves of six instead of the three armour-clads ordinarily away on that particular foreign service. Again, owing to the failure of an experiment on a large scale with heavy guns in course of construction, four armoured cruisers and three battle-ships were not available, from the non-delivery of their heavy armament. This is not likely to occur again, as the experience gained by contractors in the manufacture of heavy guns, and the gradual accumulation of a reserve of heavy breechloading guns, should prevent a repetition of this miscalculation. The three vessels included in the first category are now at home, and those in the second category will all, in four months, be available for service. This increase of force is in addition to the vessels that are to be completed this year in the normal programme.

These two facts should be known, as otherwise false inferences might be drawn from an estimate of our strength obtained under such very exceptional circumstances.

(Signed) G. H.

February 5th, 1889.

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Naval Manœuvres.

FOREIGN NAVIES.

French Naval Manœuvres, 1888.

The first operation of the season 1888 was the attack on Ajaccio by a squadron under Admiral Amet. The defending force was under Admiral Desarenne. An experiment in coaling at sea was a most noteworthy incident. The attacking fleet succeeded on this occasion in taking on board 500 tons of coal at sea from the collier Caravane, despatched from Toulon with a supply of fuel.

Coaling experiment.

The more important manœuvres took place later. On the 23rd August the following despatch was received at Toulon: "To assure myself of the condition of the ships in the second division of the reserve, I have decided that the Richelieu, Friedland, Trident, Caïman, Terrible, Bayard, Duguesclin, Triomphante, and Inconstant shall be at once commissioned. All the ships, with the exception of the Inconstant, to be manned with reduced complements. The crews of the Couronne, St. Louis, and Japon will take part in the mobilisation. When ready for sea the ships are to proceed to Hyères, and to place themselves under the command of Admiral Amet-Krantz, Minister of Marine." This order was promptly obeyed. On the 24th August the Caïman, Inconstant, and Papin sailed from Toulon, followed on the 25th by the Trident, Friedland, Richelieu, Duguesclin, and Bayard. The Terrible, Triomphante, and Faucon, which had not embarked their powder, were ready for sea in every other department.

Orders to commission nine ships.

In addition to the ships already mentioned, a torpedo-sloop, four sea-going torpedo-vessels, one torpedo-catcher, and fifteen first-class torpedo-boats were commissioned.

Other vessels commissioned.

Having mustered at Hyères the ships went through all the usual drills and exercises, including firing practice with heavy guns, small arms, and torpedoes. The torpedo-boats were actively exercised.

Evolutions.

On the 30th August the fleet, mustering fourteen ironclads, seven cruisers, and seven torpedo-vessels, was formed in two divisions, under Vice-Admiral Amet and Rear-Admiral Desarenne. The entire

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day was devoted to steam tactics, advancing from simple to the most complicated movements. The ships were handled to the entire satisfaction of Admiral Amet. Steam tactics.

On the 4th September the squadron began to break up, and in the six succeeding days all the mobilised ships returned to Toulon. Squadron broke up.

In commenting on the operation, M. Weyl remarks that the French fleet was seriously deficient in cruisers, that torpedo-vessels are of little use as scouts, and that in the case of a night attack the electric light offers an effective means of defence. M. Weyl.

The manœuvres occupy an important section of the Report of the Committee on the French Navy Estimates for 1889. We give an abstract:—

"*Organisation of the Naval Defences.*—We have been anxious to find out whether the sums provided in the estimates and the means available at the several ports will secure the mobilisation of the fleet within the periods prescribed under the regulations. We have received satisfactory assurances from the naval department. Committee's report.

"The efficient manning of our ships mainly depends on the seamen actually serving at the date of a declaration of war, whether afloat or in barracks at the dockyards. The staff of the training establishments is the only additional resource immediately available. The men who, under the regulations of the maritime conscription, will be liable to be called out at short notice, would require a certain amount of training to become thoroughly efficient. We consider it indispensable to raise the effective strength of the force in barracks. They should be organised as crews for the manning of ships in the first or second division of the reserve, and be held ready for instant embarkation." Effective strength of men in barracks to be raised.

The Parliamentary Commission were of opinion that the Navy was not sufficiently strong in officers in the subordinate ranks. The reserve of seamen was to a certain extent a force on paper. Many men were included in the lists of the maritime conscription who were over forty years of age, and were only capable of service in the forts or batteries on the coast. Referring to the ships which had recently been commissioned, they were unable to regard the recent experiments as a real test of the resources available for an actual mobilisation. The ships had been completely manned with the seamen ordinarily available in time of peace. The ironclads put in commission for a few days to make up the squadron of the north included the Tonnerre and the Furieux, at Cherbourg, and the Fulminant, at Brest. The Tonnerre was ready in nine days, the Furieux in eight days, and the Fulminant in ten days. Insufficiency of subordinate officers. Tonnerre, Furieux, Fulminant.

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The ships temporarily commissioned were manned, not with the full strength required for war, but only with the reduced complements which were absolutely necessary for working the ships and for insuring their safety. The seamen at Toulon not being sufficient to furnish the necessary contingents, it was requisite to draw somewhat largely on the gunnery ships and on the engineer and torpedo schools. The experiment was nothing more than a provisional placing in commission of ships under special conditions, with a view to ascertaining that they were in all respects fit for sea.

Having criticised defects somewhat harshly, the Committee proceed to summarise the work accomplished. The praise they give was well merited by the Naval Department. The total strength of the fleet put in commission was as under :—

5 Armoured battle-ships,
3 Belted cruisers,
1 Torpedo cruiser,
2 Sloops—first-class,
1 Torpedo sloop,
4 Sea-going torpedo-boats,
4 First-class torpedo-boats,
6 Second-class torpedo-boats.
6 Scouts.
Total 32 Vessels.

"The ships were commissioned at Toulon at noon on the 23rd August. On the following day one ironclad and two sloops left Toulon for Hyères. The remaining vessels followed on the 25th. The operations were carried out with perfect order and regularity, all the vessels having been found in a proper condition to proceed to sea. The organisation of the crews was most efficient. The services rendered by the men belonging to the reserve were of especial value. All ranks were full of zeal, and displayed a satisfactory knowledge of their respective duties. The ships and fittings were in excellent order. The working of the steam machinery was generally satisfactory. Vice-Admiral Amet has reported in the most favourable terms of the accuracy with which all manœuvres were executed, even with the ships in close order."

Operations.

Organisation of crews efficient.

Ships and steam machinery in good order.

On the 25th and 26th January the French Mediterranean squadron made a day and a night attack on Toulon. It was desired to test the most effective methods of firing on ships from forts and batteries. The results were held to prove the necessity of supplementing the land defences with submarine defences and torpedo-boats.

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ITALIAN NAVAL MANŒUVRES.

Ships engaged.

The manœuvres of the Italian fleet in 1888 were directed by Vice-Admiral Acton. The ships engaged included the Italia, Lepanto, Dandolo, Duilio, Savoia, Bausan, Goito, Saetta, San Martino, Colonna, Tripoli, and Folgore.

Tactics.

The first part of the manœuvres consisted chiefly of steam tactics at ten to twelve knots in close order. The second period of the exercises was employed in an experimental attack upon and defence of Spezzia.

Admiral's report.

Admiral Acton reported in terms of high satisfaction as to the efficiency of the fleet and the ready co-operation of the forces ashore.

The Italian fleet took part in the pacific international demonstration off Barcelona.

At Naples, on the occasion of the visit of the Emperor of Germany, every available vessel of modern type was assembled. The list was as follows:—

Ironclads.—Lepanto, Italia, Duilio, Affondatore.
Torpedo-rams.—Etna, Bausan, Stromboli, Vesuvio.
Torpedo-cruisers.—Tripoli, Goito, Folgore, Saetta.
Sloops.—Stafetta, Galileo, Colonna.
Four torpedo videttes (125 tons).
Fourteen torpedo-boats (85 tons).
Six first-class torpedo-boats.
Yacht—Savoia.
Transports.—America, Volta, Washington, Città di Milano.

AUSTRIA.

Manœuvres are every year executed by the Austrian fleet. The ships engaged in 1888 were the Custoza, Don John of Austria, Kaiser Max, Prinz Eugen and Tegethoff (ironclads), and the Panther, Leopard and Meteor (cruisers). The fleet was under the command of Rear-Admiral Manfroni von Manfort.

GERMANY.

The German fleet, during their manœuvres of 1888, were engaged in the attack and defence of Jahde. Four ironclads, four frigates, and seven torpedo-boats, under Vice-Admiral Knorr, composed the

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attacking force. The defensive force included one ironclad, one school-ship, a corvette, four armoured coast-defence vessels, and a flotilla of torpedo-boats.

RUSSIA.

The *Cronstat Messenger*, quoted by the *Times* of September 5th, 1888, gives the following interesting account of the recent Russian naval manœuvres in the Gulf of Finland :—

Problems for solution.

"Two problems were placed before the squadrons taking part in these manœuvres. In the first place it had to be discovered if an enemy's fleet could enter the Gulf of Finland by surprise, and to then consider if it is possible to oppose to such a fleet an effectual resistance by means of a squadron concentrated at a given spot and resting on the coast defences. To attain these two objects two squadrons were formed, one to play the part of the hostile fleet, under Admiral Tchikhatchev, and composed of the armoured frigates Duke of Edinburgh and Minin, the turret ships Admiral Lazaroff and Admiral Tchitchagoff, the corvette Skobeloff, and the torpedo vessels Revel and Lakhta. The defending squadron, commanded by Rear-Admiral Popoff, consisted of the frigate Svetlanda, the corvettes Bayan and Boyarin, the clippers Plastoun and Opritchnik, the monitors Peroun and Vestchoun, the gunboats Doyd and Bouria, the torpedo-armed cruiser Lieutenant Ilyn, the torpedo-boats Longa, Kotline, and Narva, the steamers Dnieper, Rabotnik, and Ilmen, the schooner Slavianka, and nine torpedo launches. On the 12th of August, at nine in the evening, the whole assailing squadron had collected off the lighthouse of Dagerord, and wishing to deceive the watchfulness of the lighthouse officials, who were supposed to be watching and reporting the movements of the squadron, sailed north of the cape, pretending to be making for Schagelacht Bay, in the Island of Œsel, then changed its course and made for the Botcher lighthouse in the Aland archipelago. It then discovered that these precautionary measures were useless, as the officials in the lighthouses had not been placed in communication with the commander of the defending squadron. Arrived off Botcher the assailing squadron took all its measures for penetrating into the Gulf of Finland without being seen. It was formed into two lines with the Admiral Lazareff, as the worst sailer, in front, to regulate the speed of the flotilla. The ships advanced at a distance of more than 200 yards from each other. All fires were put out, the hours were not sounded, the orders were given in a low tone, and all night signals were stopped, except

Two squadrons formed.

Two lines.

Precautions.

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in cases of sheer necessity. The gunners stood at their pieces, the mitrailleurs were armed, and the word was passed to watch closely to the accuracy of the aim. On the night of the 14th of August the squadron changed its line of attack to an extended chevron, and off Tackhon it re-arranged itself into two columns representing a chess-board. The object of placing the Admiral Lazareff in front was that it might entice some of the opposing vessels to advance too close, when the fast sailing vessels in the rear could put on full steam and surround the incautious adversary. The vessels of the defending squadron intrusted with the work of reconnoitring were the torpedo-boats Revel and Lakhta, considered to be of about equal strength to the torpedo-bearing cruiser of the enemy's fleet. These two vessels were ordered to search any merchant vessels they met with. The defending squadron had also taken many precautionary measures. Rear-Admiral Hercken commanded several vessels drawn up in two lines to close the entrance to the Gulf of Finland. Special signals for night and for day were agreed upon to warn the defenders of the approach of the enemy and of the number of his ships. The commander of the defending squadron assumed that during the night his opponent would not dare to cut off the retreat of any of his ships on scouting duty. In reality this was the prime object of the assailant. All the necessary arrangements were excellently carried out on both sides."

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II.

Observations on the recent Naval Manœuvres.

To the Editor of The Times.

Sir,—While the naval manœuvres recently brought to a close still engage, as I trust they will long continue to engage, the attention of the public, I ask the privilege of contributing to the discussion, through your columns, the dispassionate reflections of an eye-witness.

Proposed here to deduce lessons.

In the present communication it is proposed to deduce lessons without attempting to review in detail the successive incidents which occurred. Our recent experiences have made it evident how severe is the strain of maintaining a blockade against a steam-propelled fleet. In the old sailing days a blockaded force could only escape with the aid of fair winds. In calms, and when contrary winds prevailed, the blockaders were sure that the enemy would not move. The introduction of the torpedo-boat has been distinctly for the advantage of a blockaded force. It is exhausting to keep watch, night by night, off the entrance to a port, in momentary danger of attack by a dimly seen enemy.

How use of steam has altered the conditions of a blockade.

Opinion, before the Manœuvres, of the relative strength of the squadrons employed.

Before the commencement of the manœuvres it was doubtless the opinion of the Admiralty, as it was certainly the opinion of the admirals, that the contending forces were not unequally matched. Admiral Baird had a decided superiority of force, and the conformation of the coast in the vicinity of Bantry, so closely resembling the approaches to Brest between Ushant and the Raz de Sein, offered no special facilities for breaking the blockade. Ships making a rush for the open sea from Berehaven are hemmed in on the north by the line of coast stretching in a direction to the south of west as far as Darsey Island. On a S.S.E. bearing from Berehaven the promontories of Sheep's Head and Mizen Head jut out in succession into the ocean. Mizen Head and Darsey Island are nearly equidistant from Berehaven. They lie, roughly, within a radius of 20 miles. Thus, for the first and most critical hour in the operation of breaking the blockade, the fastest ships of Admiral Tryon's fleet were limited, in the range of courses which could be steered, within an arc of 90 degrees. It is certain that escape from a superior force was only possible under cover of dense fog or almost impenetrable darkness.

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Admiral Tryon had not long to wait for his first opportunity. On the 27th July the fog was so dense that it would have been impossible for a fleet in the offing to prevent some of the blockaded ships from putting to sea, had it been permitted to Admiral Tryon to make the attempt so early. After an interval of a week a night of pitchy darkness enabled the Warspite, Severn, and Iris to escape from Berehaven unobserved by the heavy ships of Admiral Baird's force. They passed quite close to the Sunbeam without being seen. The continual flashing of the electric light, and the showers of rockets thrown up from the torpedo-boats on both sides increased the difficulty of penetrating the surrounding gloom.

Chance of the squadron breaking though very soon occurred.

It is possible that Admiral Tryon's ships might have been intercepted if the blockading squadron had been nearer to the entrance to Berehaven. In conditions of weather such as have been described heavy ironclads close in with the land would have been exposed to continual danger of being torpedoed. Nets are the only defence as yet devised, and they are not available for ships under way.

Accepting the results of the recent operations, as it is agreed on all sides that we should, as conclusive evidence of the greatly increased difficulty of sealing up an enemy within his own ports, it is clearly essential that our Navy should be prepared to sweep the seas with cruisers. The experiences of the manœuvres will be of considerable value in the selection of efficient types. The most powerful which has as yet been produced was represented by the Warspite. Having been the subject of much adverse criticism in relation to the increased draught of water and the distribution of armour, it is gratifying to those responsible for the order to build the ship that she has been found in practice in a high degree efficient for the duties for which she was designed. Ships of the Warspite type should find a place in the programme of construction to be next submitted to Parliament. In the new ships it would be desirable to give protection, by means of armour, to the guns on the upper deck. Details would be out of place. It will be sufficient to suggest that this object may be effected by concentrating the 6-in. guns amidships, and by taking armour from the inner semicircles of the turrets and placing it on the broadside. Five second-class unarmoured cruisers of recent construction were commissioned for the manœuvres. In the four Merseys and their four predecessors of the Arethusa type a success has been achieved. The symmetry of design is attested by a fact which every seaman will appreciate. To the eye these vessels appear considerably under their actual tonnage. They are splendid sea boats. They have a high rate of speed, a powerful armament,

Our Navy should have cruisers to sweep the sea.

Warspite.

Mersey class.

Arethusa class.

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and protection for buoyancy and machinery by armour and internal subdivision. As cruisers intended to keep the seas, their lofty sides and ample freeboard are a valuable feature. Great as the improvement has been in the vessels recently completed, we are promised a decided advance in speed in those now building. The armament will be lighter, but the guns will be of the latest pattern. The tonnage will be less than that of the Mersey class.

Cruisers now building have very great speed.

It is difficult to fix a *maximum* for our requirements in the class of cruisers under consideration. The Merseys are a success. The vessels we are now building will be a valuable addition to the Navy, and we want on our list such cruisers as those lately built by the Armstrong Company for Italy.

We want cruisers such as the Piemonte.

Archer class.

From the Warspite and the Mersey to the Archer class we descend from 8400 tons and 3550 tons respectively to 1630 tons. The Archers, eight in number, were represented in the recent mobilisation by six vessels. They sit well on the water. End on to the wind, they ride the sea with easy motion. They are powerfully armed; they have good coal endurance, and a high speed on the measured mile. It has been objected that we have attempted too much within the limits laid down for displacement, that we have carried reductions of weight too far in hulls and engines, and that the ships are overloaded with armament and overcrowded with men. It would be easy to reduce the weight of armament by substituting 4-in. for 6-in. guns.

Speed at sea with reference to measured knot speed.

It is more difficult to devise a remedy for the shortcomings of the Archer class under steam. It would obviously be unreasonable to rely on a speed at sea equal to that attained at the measured mile. The Admiralty tables point out that not more than about two-thirds of the full power developed under fixed and most favourable conditions can be expected in continuous steaming at sea. The measured mile power and speed is a standard performance, absolutely identical for all ships of war, and is needed by shipbuilders and engineers for comparisons of form and proportions. The Archers could work at sea with two-thirds of their extreme power, or even more, if, like mail steamers, they made definite runs at an unchanging speed. What tries the boilers is to lie still or crawl about with banked fires, and then make a rush at full speed. The ordinary work in the engine-room of a man-of-war is a poor preparation for a sudden and excessive strain on men and machinery. It is when the utmost effort is called for that the disadvantages are felt of the want of that ample space and good ventilation which are easily afforded in a merchant ship, where there are fewer compartments, and where there is no necessity to keep machinery below the water line.

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In the manning of the Navy the blot which it is most urgently necessary to remove is the defective training of the stoke-hold and engine-room staff. The mobilisation puts numbers of young untrained artificers and stokers into the ships, and difficulties must be expected. We are making progress in the management of the machinery of torpedo-boats. We are training men to this work by keeping a few boats, manned from the torpedo schools, constantly under way. A vessel of the Archer class, and another of the Severn class, should be kept in commission at the home ports. All young engineers, artificers, and firemen should go through a course of instruction in these vessels in the management of engines at full speed. At Spezzia an ironclad of the Italian Navy is daily under way for a similar purpose.

The present blot in regard to our *personnel*.

The Italian practice.

It is a question whether, even under the new regulations, the trials of ships are sufficiently severe before they are passed into the service. A voyage at full speed to Gibraltar and back for cruisers of the Archer class, and to Halifax and back for larger vessels, would discover many weak points, and afford a much-needed opportunity of training for engineers and firemen. I would not recommend additional vessels of the Archer type.

Regulations respecting speed trials considered.

From the Archer to the Sandfly, a type represented in the manœuvres by three examples, we drop from 1630 tons to 450 tons. A force, and a considerable one, of effective sea-keeping torpedo-boats is an evident necessity for the British Navy. If Admiral Baird had had more Sandflys at his disposal the blockade of Berehaven would not have been broken in the circumstances of weather in which the Warspite and her consorts got clear. Our shipbuilding should be vigorously pushed forward on the line of the Sandfly class. The construction of these useful vessels is due to the wise initiative of the present Board.

Sandfly.

More vessels of the class are required.

While we have reason to be satisfied with the types already produced, in the construction of the future it will be desirable to secure more power to contend with weather, and more convenience and comfort for a long service at sea. These objects can only be attained by adding to tonnage.

Future ships should have better sea-keeping qualities.

Turning to the battle-ships which were brought together in the recent mobilisation, our most recent creations, of the Admiral type were generally approved. When the squadron under Admiral Fitzroy passed through The Race, off Portland, going down Channel, at the commencement of the manœuvres, the Rodney's upper deck was dry, while that of the Devastation was awash and her crew were driven below. Physical deterioration must inevitably result from prolonged confinement under hatches. All naval construction for

Admiral class.

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the purposes of war must be a compromise between the demand for more armament and armour and the necessary limits of tonnage. The weak points in the Benbow are the exposed position of the heavy guns, mounted *en barbette*, and the want of protection by armour for the 6-in. guns in the battery. The carnage which would occur in action at unprotected guns has been described with vivid imagination by the author of "In a Conning-tower." Machine-gun fire has been greatly developed in the armament of recent ships. We have followed the French, and with doubtful advantage. In a close action there will be great loss of life among crews fighting in the open, and with no decisive result. While his ship remains uninjured in hull, machinery, and the heavy armament, no captain will surrender. Better it would seem to keep the light guns within such limits as to number as will allow of protection being afforded to their crews. It is more easy to point out defects than to contrive remedies. In the actual experience of battle it might be found that four 22-ton guns in close turrets would be more than a match for two 11-ton guns mounted *en barbette*.

Conqueror and Hero.

Passing from first-class to second-class ironclads, the Conqueror and Hero have many points of excellence. They steam 15 knots; they are particularly handy; they are well-armed and heavily armoured. The want of stern fire is the main defect; and this might be remedied by cutting down the superstructure at the after end. The saving in weight of hull would provide for a heavy gun protected by armour.

Improvements in the type of which the Conqueror and the Hero are the sole representatives is a subject to which the attention of the Admiralty and their professional advisers may with great advantage be directed. All the considerations which moved the Admiralty of the day to lay down the Conqueror and her consort may be urged, and with even greater weight, at the present time. If twelve years ago it was held to be imprudent to put too many eggs into one basket, *à fortiori* such a policy is to be deprecated in view of the growing strength of the torpedo flotilla in all the Navies of the world. The merits of the type were recognised at the Admiralty, but when the designs for two improved Conquerors were taken in hand, demands were pressed, as usual, for increased calibre in the guns, increased thickness in the armour, for larger additions to the minor armament, for more speed, and more coal endurance. In the endeavour to satisfy these severe and conflicting conditions the Conqueror of 6000 tons grew into the Victoria of 10,470 tons, and the cost was raised from £418,000 to £725,000. The future programme of construction should

The Conqueror grew into the Victoria.

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include ships of the Conqueror type, with every improvement that ingenuity can contrive, within the limits of tonnage laid down for the original design.

Having dealt with the modern types, we turn to those older vessels which have for so many years done duty as flagships in the Channel Fleet. During the manœuvres the Northumberland carried the flag of Admiral Baird, the Agincourt that of Admiral Rowley. These noble ships should not lightly be put aside as obsolete. The quick-firing ordnance described by Lord Armstrong in his interesting address at the Elswick meeting, and the discovery of explosives frightfully destructive in their effects, will certainly take us back to the older methods of protection. Recent experiments in France, and our own experiments on the Resistance, have shown that a more extended protection must be given by armour to the upper works of ships. As the area protected increases, so the thickness of the armour must be reduced, and thus we return to the earlier type of ironclad.

The older ironclads, Northumberland, Agincourt, &c.

If the method of protection is accepted, the Northumberland class will compare favourably with later designs in almost every particular which constitutes efficiency in a man-of-war. In long cruises their crews could be kept in health by exercise, as they certainly could not be in the confined ships of later date. As fighting ships, the Northumberlands have some advantages over vessels of more recent design. A single well-placed shot may silence the fire from a turret or a citadel. This can scarcely happen when the guns are carried on a long length of broadside. It cannot be claimed for the ironclads of the first period that they are fit antagonists in the line of battle for the most recent ships. They would find their more appropriate sphere as cruisers. With triple-expansion engines, driving a single screw, I have the authority of Sir Edward Reed for saying that a speed of 16 to 17 knots would be reached. To economise coal, sail power should be retained, the five masts being reduced to three. Internal subdivision might be extended. In the three ships of the Northumberland type, the Achilles, the Hercules, and the Monarch, we should have an instalment of that reinforcement of cruisers for which, as Sir Geoffrey Hornby has shown, the necessity is urgent. The Black Prince, Warrior, and Audacious class should be taken in hand later.

Should be fitted with new triple-expansion machinery.

Also Black Prince, Warrior, and the Audacious class.

In concluding these observations on shipbuilding, suggested by the recent mobilisation, a few words must be said on the subject of torpedo-boats. For service in open waters the larger the boats the better. A type which should combine the Yarrow boilers, the Thornycroft engines, and a hull built on White's turn-about system, would approach very near to perfection.

Torpedo-boats.

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Having dwelt at length on the lessons to be drawn from the mobilisation in relation to the shipbuilding policy of the Navy, let us turn to the *personnel* of the fleet—a more important but, happily, less debatable topic. And, first, some words of praise are due to the Admiralty. It was a bold and politic act of administration to bring together the most powerful fleet which has been assembled in modern times, and to lay down a programme of exercises so calculated to test the efficiency of the Navy. Throughout the fleet the zeal displayed and the state of discipline were most satisfactory. In this regard the coastguard never fail to show an example to the younger men. I was informed by the captain of one of the ironclads of the first reserve that the periodical embarkation of 350 additional men for the annual cruise has the singularly yet gratifying effect of reducing largely the total number on the defaulters' list.

The *Personnel*

Coast-guard.

The coastguard is our first and best reserve. As, however, considerations, both of expense and efficiency, impose a limit on their numbers, it has been found necessary to create a still more numerous reserve in the mercantile marine. So long as we refuse to accept compulsory service such a reserve must be our answer to the *inscription maritime*. We have no reason to withhold our confidence from the naval reserve, but it is as yet untried and imperfectly organised. When a trial was being made of our whole resources for the mobilisation of the fleet, it is to be regretted that no seamen from the naval reserve were invited to volunteer for duty. Officers of the reserve should always be called out on the occasion of a mobilisation, and care should be used that those embarked are suitable for the duties of their rank on active service. Grey-haired veterans of the mercantile marine are useless as sub-lieutenants.

Naval Reserve.

Reserve of Engineers and Firemen.

If reserves of seamen are needed, still more necessary is it that the Navy should have a reserve of engineers and firemen. The unsatisfactory performances of new ships under steam may be attributable in part to inexperience. In this matter it would be possible to obtain help from the mercantile marine. I would make two suggestions:—

Two suggestions

1. Supplement the means of training in the Navy by passing engineers and stokers through a course of practical training on board Umbrias and Etrurias. 2. In a large mobilisation fill the engine-room complements with experienced men from the Royal Naval Reserve.

The still younger force of Royal Naval Artillery Volunteers should be included in the annual mobilisation. If their sphere is primarily harbour defence, there will always be men who could qualify for gunnery ratings in heavy ships.

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The mobilisation has shown the importance of an effective system of local defence for those great ports which it is vain to expect that an enemy would spare. A real enemy should meet with a reception very different from that permitted to Admiral Tryon. Pilots would be unavailable; buoys, beacons, and lightships would be shifted; mines and other obstructions would be laid down. To the means of defence already in part provided there should be added torpedo-boats and armed tugs, manned by well-trained crews of seamen, artificers, and stokers, and by the Royal Naval Artillery Volunteers.

Additional defences required.

A few words, in conclusion, on the duties assigned to the admirals. In future mobilisations it will be advisable to place a single officer in supreme command. Such a step would have a moderating influence on the tendency to push emulation to excess. Comparisons of the individual merit of officers, where all were doing their utmost, and where the relative difficulty of the task assigned to each was conspicuously unequal, are strongly to be deprecated. The wear and tear of anxious watching and uncertainty as to the movements of his adversary fell chiefly on Admiral Baird. If less vigilance was called for on the part of Admiral Tryon, he spent his days and nights in planning the skilful strategy by which success was achieved. To Admiral Baird, and to the officers and men under his command, belongs the merit of having with a cheery spirit kept the sea from the beginning to the end of the manœuvres, no accident having occurred through all the perilous circumstances of bad weather, dense fogs, and utter darkness with which they had from time to time to contend. It was obvious from the beginning that it would be impossible to prevent some of Admiral Tryon's ships from getting away. Once having escaped it was idle to give chase, with no information of the direction taken by the enemy.

One Admiral in supreme command.

The experiences of the manœuvres show the imperative necessity of a second line of defence. St. George's and the English Channels must be guarded by effective squadrons. The local defences of the ports will form a third line of resistance.

Necessity of a second line of defence.

All that has been here insisted upon can be done, and with no undue delay, by a steady policy in relation to expenditure. In this I fully concur with the present Board. It has been the object in these too extended observations to indicate the lines on which we should proceed.

I am, Sir, your obedient servant,

BRASSEY.

11*th October*, 1888.

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III.

The Actual Strength of the British Navy.

THE EXPENDITURE REQUIRED TO SECURE ITS SUPREMACY.

Address delivered by Lord Brassey, K.C.B., before the London Chamber of Commerce, Mansion House, 1st February, 1889, the Lord Mayor in the Chair.

IT is a privilege which I highly value to be permitted to deliver an address on the state of the Navy, under the presidency of the chief magistrate of this great city, and under the auspices of its Chamber of Commerce.

Impracticable to deal with the entire administration of the Navy.

I must open by saying that within the compass of a single paper it is impracticable to deal with the entire administration of the Navy. A choice of topics must be made, and attention will obviously be required to points under discussion, rather than to those, perhaps, of even higher importance, on which all men are agreed. It is of vital importance that the *personnel* of the fleet should be sufficient in numbers and in the highest state of efficiency. On the point of efficiency we have no anxiety. As to numbers, Lord Alcester and other officers have recently given public expression to the views of the highest authorities. Our ships and guns are the great subjects on which doubts have been expressed. I deal to-day with the ships.

Personnel.

Lord Alcester's views.

Ships dealt with.

By whom discussed.

In the discussion of this subject, of such vital interest to the British nation, Sir Thomas Symonds, Sir Geoffrey Hornby, Lord Alcester, Lord Charles Beresford, Captain Fitzgerald, and other able and distinguished naval officers have taken a leading part. To their authority to advise on the naval policy of the country I have no claim. I may, however, be able to assist the elucidation of the naval problem by the contribution of information not easily obtained.

Comprehensive survey necessary.

Before deciding as to what should be done for the reinforcement of the Navy, it is essential to take a comprehensive survey—to look back into the past and forward into the future—to look even more to what is being done or is in contemplation abroad than to the actual condition of our Navy, and its rate of depreciation.

Before, and during my period of service at the Admiralty, and more

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recently as compiler of *The Naval Annual*, it has been my duty to keep a close and constant watch on what is going on abroad and at home. It will be my endeavour to present the leading facts as they appear to me, in a clear and condensed form. And here it may not be superfluous to point out that the naval advisers of the Admiralty cannot by mere personal and official influence, unsupported by a strong expression of opinion out of doors, obtain the consent of Cabinets to important increases of expenditure. If the public is indifferent, the controlling power of the Treasury—always, and properly, exercised to enforce economy—will make itself felt. The Treasury is not competent in matters naval. In the absence of a demand which must come from without, its rule is, as stated by the Admiralty witnesses before the Committee of the House of Commons on Navy Estimates, to take the expenditure of the preceding year as a basis for the expenditure of the next. The rule, it is obvious, rests on a mere arbitrary assumption and not on any sure and guiding principle of naval administration. The expenditure necessary for the Navy cannot be a constant quantity or be treated automatically. The measure of our own necessities must be taken by first looking to the strength and the expenditure of other powers. It is our duty to keep our fleet superior to that of any possible enemy, whether a single power or two or more powers combined. As Sir Arthur Hood told the Committee of the House of Commons, if other Powers lay down more ironclads, we must lay down vessels faster and more powerful. If they strengthen themselves in cruisers, we must maintain our superiority by a proportionate increase of construction.

Naval advisers require outside assistance.

Treasury economy follows public indifference.

What Admiralty witnesses have said.

Necessary expenditure not automatic.

Sir Arthur Hood's views.

Having made these general observations, I proceed to give, in a summary form, a comparative view of the strength of the British Navy.

Having due regard to considerations of time, and to the non-professional character of this meeting, I shall not attempt to give a comparison ship by ship. The tables which are in your hands, and for the accuracy of which I am largely indebted to Mr. Barnes, the late Surveyor of Dockyards, supply all the necessary information. I will confine myself to a general analysis, taking the broad facts of collective numbers, tonnage, and date of completion. I shall assume with confidence that as between one great maritime Power and another, the naval and professional advisers are evenly matched in ability and experience. If this axiom be accepted, it will follow that, as between ships and groups of ships, designed for similar service, and of approximately even date, the relative fighting efficiency will vary as the tonnage.

The appended tables.

Assumptions.

What necessarily follows.

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In the tables, of which I give a summary, the English fleet is compared with a combination of the ships of France and Russia.

Battle ships launched since 1st January, 1879.

To begin with the battle-ships. Of this class, launched in 1879 and subsequently, the British Navy has 16 ships with a collective displacement of 155,280 tons. The combined fleets of France and Russia muster 17 armoured battle-ships, launched in the same period, and having a collective displacement of 163,043 tons.

Number of battle-ships launched before 31st December, 1878.

Of battle-ships of an earlier date, launched before 1878 and still reckoned effective, England has 17,* with a collective displacement of 143,210 tons; France has 12 ships of 86,687 tons; Russia has two ships of 13,840 tons.

Ships not effective without repair.

On the list of battle-ships not effective unless repaired, we have 5 ships, of 33,720 tons; the French 9 ships, of 34,989 tons. Our Valiant, Hector, and Defence are worth repair for harbour defence in the ports of the Antipodes. I would specially instance the protection of such a port as Adelaide.

Comparison.

From this comparison it is clear that in battle-ships we are not a match for such a combination as we are bound to keep in view.

French new ironclads.

Turning from the list of ships built to the list of those ordered or on the stocks, we find that in France two battle-ships—the Brennus, 10,826 tons, and the Magenta, 10,600 tons, have recently been laid down.

Russian new ironclads.

In an article on the naval construction in progress, published in the *Times* in December, it is stated that Russia is building two ironclads of 8000 tons each, on the Black Sea, and two on the Baltic, of of 9800 and 6600 tons respectively.

It is perhaps to be regretted that we have hesitated to lay down battle-ships at a time when considerable activity is being displayed elsewhere.

Coast defence ships.

To complete the list of ironclads, it will be necessary to refer to vessels for coast and harbour defence, classes of relatively small importance to a power which is resolved to maintain the command of the seas.

British.

For coast defence, we have the Orion, and Belleisle, Rupert, Hotspur, and four others, of the Gorgon type—all launched within the period 1870–79. Their collective displacement is 33,110 tons.

French.

The French are decidedly stronger in this class. They have 14 vessels, measuring 41,496 tons, the oldest launched in 1875. The seven latest vessels included in the French coast-defence list are armoured gun-

* If the Sultan is not raised, this number will be reduced to 16, and the total number of tons displacement will be reduced to 133,920.

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boats, designed as an answer to the armoured gunboats laid down for Germany. French naval critics do not speak favourably of the gunboats.

In the list of coast-defence vessels, the French have the powerful ships Fulminant and Furieux, of 5700 tons. We have no similar vessels.

Russian.

The Russian list of coast-defence vessels contains seven ships, all of the earliest period of armed construction, and, measuring in the aggregate, 24,441 tons. It is not probable that these Russian vessels will leave the Baltic.

Harbour defence ironclads.

Our harbour-defence ironclads are ten in number, of 30,940 tons. All are efficient for harbour defence. The Penelope, although a sea-going ship, has been added to the list, having been despatched to the Cape for the defence of Simon's Bay.

British.

French.

France has no mere harbour-defence vessels. The Russians have fifteen such ships, of 27,216 tons.

Cruisers.

Following the order adopted in preparing the return laid before Parliament on the motion of Lord Charles Beresford, we pass on to the cruisers. Speaking before the representatives of the shipowners of this great maritime country, it would be a waste of words to insist on the importance of strength and efficiency in this section of the fleet.

British armoured cruisers.

Taking first the armoured cruisers, the lists for France and Russia are made up from Lord Charles Beresford's return. To the British ships included in that return, the ironclads of the period 1860–66 have been added. The Northumberland, Agincourt, Minotaur, Achilles, Black Prince, and Warrior are in good condition as to their hulls. The method of protection can scarcely be condemned as obsolete. Quick-firing guns and highly explosive shells have brought us back to the comparatively thin armour, spread over a wide area of side, which was used during the first period of armoured construction. The French are building ships, in respect to the system of protection, almost identical with those we have the good fortune to possess ready to our hand, and which can quickly be brought up to modern requirements. I have consulted Sir Edward Reed as to the capabilities of these ships, and I have his authority for saying that with improved engines they could attain a speed of 17 to 18 knots. The ships under consideration have been criticised for their excessive length. It is well to remember that length is a valuable feature in the maintenance of speed when contending with the long rollers which sweep the Southern Ocean. If we were engaged in a serious conflict, an effort would be made to intercept the trade along the great ocean routes

Ships of Minotaur class should be added.

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between England and her colonies. For the protection of this trade the Northumberland and the long ships of the same type fitted with a turtle-back forward, would be eminently suitable.

British armoured cruisers with the early ironclads added.

Adding the early ironclads to the list of armoured cruisers, as given to Parliament, we have for England, completed and completing after launching, eighteen ships, of 137,050 tons. France has four ships of 24,200 tons, and Russia seven ships of 40,312 tons. Two armoured cruisers of the Dupuy de Lôme type, of 6300 tons, and a speed of 20 knots, are on the stocks for the French Navy. It has been reported that another vessel of the same type will be added to the French programme, as presented in the Navy Estimates. No vessels of the same class are in progress for the British Navy. The laying down of armoured cruisers, commencing with the Warspite and Impérieuse, and followed up with the five ships of the Orlando class, to which Lord George Hamilton added two, was a marked feature of our ship-building under the administration of Lord Northbrook.

French armoured cruisers.

Un-armoured cruisers.

We now come to the unarmoured cruisers. They will be most conveniently classified with reference to speed. As a rule, the fastest ships are the latest, and the slowest are the oldest. Our position will be most concisely stated in a tabular form.

UNARMOURED CRUISERS COMPLETED AND COMPLETING.

Speed.	ENGLAND.		FRANCE.		RUSSIA.	
	Ships.	Tons.	Ships.	Tons.	Ships.	Tons.
20 knots and over ..	2	5,600	..	..	..	..
19-20 knots	3	8,850	7	22,020	1	5,029
18-19 „	2	7,460	1	1,540	..	..
17-18 „	15	35,220	3	3,840	..	..
16-17 „	7	30,880	3	15,888	..	..
15-16 „	4	15,490	6	13,769	2	5,900
14-15 „	6	15,160	16	38,673	2	4,284
13-14 „	20	40,470	4	6,716	..	..
12-13 „	6	13,090	2	3,450	10	16,015

Comparisons.

The French take a decided lead in vessels capable of steaming 19 knots and upwards. Descending to the slower speeds, our superiority becomes conspicuous. In 16 to 18 knot ships we have

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twenty-two of 66,100 tons, as against six French ships, of 19,728 tons. In the class of 15–16 knot vessels the two Powers are approximately equal. In 14 to 15 knot vessels the French have more than double our strength, and our great superiority in numbers and tonnage in the class of 12 to 14 knot vessels gives us no compensation. Our numerous and costly unarmoured cruisers of modern date, with speeds under 14 knots at the measured mile, and under 12 in blue water, constitute the gloomiest page in the history of shipbuilding for the British Navy. No less than twenty-six vessels of this class were launched in the ten years 1874–84. The aggregate cost was no less than £2,792,291.

Gloomiest page in our shipbuilding history.

Such an expenditure is the more to be regretted in view of the fact that the sixteen 14–15 knot ships in the French list of cruisers were for the most part contemporary with British vessels of two knots less speed.

In criticising the construction of the past with the cheap wisdom which is derived from experience, no blame is cast upon individuals. The C and the Gem classes of cruisers represent the ideas in vogue in the Navy some fifteen years ago. We clung to canvas, and to the seamanship which was a proud tradition of the service, and we accepted models built rather for good sailing than for great speed under steam. The vessels which I have criticised as of little service in war are excellent for police of the seas.

We now turn to our list of unarmoured cruisers on the stocks. If we put aside the Vulcan, as practically a non-combatant, and the five light cruisers of the Australasian contingent, we have our Blake and Blenheim, of 9000 tons and 22 knots, to match three French ships, Alger type, 4160 tons and 19 knots. We have the Barham and Bellona, 1830 tons, 19·5 knots, to match the Davoust and Suchet, 2977 tons, and the Surcouf, 1850 tons, all three having a speed of 19 knots. Under 19 knots we have four Blonde class, 1580 tons, 16·5 knots. France has two torpedo cruisers of the Vautour type, 1280 tons, 18 knots. We are building many gun-vessels. The French are building none.

Unarmoured cruisers on the stocks—British and French.

The torpedo flotilla will complete the enumeration of the fighting ships of the three Powers under review. Omitting the Vesuvius, the Polyphemus, the pioneer of our torpedo vessels, was a bold experiment. Torpedo rams with more armour and of less complex construction, should be added in numbers to the fleet. Latterly great efforts have been made, and wisely so, to strengthen our Navy in torpedo-vessels capable of keeping the sea. Built and building, we have 11 vessels of the Sharpshooter and Rattlesnake types.

Torpedo Flotilla—British.

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French and Russian.

The combined strength of France and Russia in sea-going torpedo-vessels is 11, of a type inferior to our own.

Mere torpedo-boats are the arm of the feeble. They are valuable only for defence, and need not occupy us to-day. The march of improvement is rapid, and torpedo-boats can be built quickly. We should build up to our need for purely local defence.

General results.

We may now give the general results of our comparison of ships built and building.

Our relative strength.

Battle-ships.—In ships of the last decade we are inferior to the combined strength of France and Russia. In ships launched before 1878 we have a decided advantage. Our non-effective ships are more capable of repair than those of the French. On the stocks we are doing nothing. France and Russia are at work.

In coast-defence vessels we are much behind.

In harbour defence we have equality.

In armoured cruisers we have an advantage, and can make our present superiority yet more decided if we take in hand, as we ought to do, the fine ships which our predecessors had the wisdom to build of iron, while our neighbours were constructing in wood.

In that most important class, the sea-keeping torpedo-vessels, we have made a good beginning. Vessels of this class in sufficient numbers might decide the issue in a great battle at sea.

In unarmoured cruisers we are deficient in ships of commanding power and speed.

Our past shipbuilding policy.

Having given a comparison of the ships, it will be interesting to trace the shipbuilding policy of the past, as it is expressed in Navy Estimates. And here it is perhaps necessary to remark that it is in vain to expect an important increase in our rate of construction without addition to expenditure. Diligent and able critics, both in and out of Parliament, have accomplished much in the improvement of administration. I do honour to the present Government for all that they have achieved; but as an old official it is my duty to express the conviction that neither the dockyards nor the Admiralty are quite so black as they are painted. The utmost that can be accomplished in the direction of economy only amounts to a small percentage on the cost of building.

Utmost economy in administration can only amount to a very small percentage.

Proceeding to review the expenditure on shipbuilding, the fluctuations at successive periods are shown in Table X.

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EXPENDITURE ON CONSTRUCTION OF NEW VESSELS.

(Hulls and Machinery.)

	England.	France.
1863–78 = 15 years ..	£22,769,928 ..	£12,746,948
1878–83 = 5 „ ..	7,772,519 ..	7,184,832
1883–89 = 6 „ ..	17,523,160 ..	10,041,846
	£48,065,607 ..	£29,973,626

Relative expenditure on new construction in England and France.

Before the Franco-German War, our expenditure on construction had been double that of the French. In the ten years, 1868–78, the French Navy Estimates were cut down, under the financial pressure consequent on the payment of the war indemnity to Germany. In 1878, a sudden change took place in the relative scale of naval expenditure. Peace being for the time assured by the Treaty of Berlin, and a large reinforcement having been added to the British Navy by the purchase of ironclads during the Russo-Turkish War, considerations of economy were held paramount, and our rate of progress in construction was brought down to a bare equality with that of the French. Speaking in the House of Commons, in reply to Lord Charles Beresford, Lord George Hamilton said that the average expenditure on new construction for the six years ending 1884–5 was £1,650,000, while in France, for the same period, the average was £1,450,000—a difference of only £200,000. In his opinion that was a dangerous approximation.

Lord Northbrook's programme.

In 1880–81, we began slowly to draw ahead. Later, aroused by the vigilance of the press, the country became anxious as to the state of the Navy. More vigorous efforts were insisted upon, and a large programme of additional shipbuilding was laid before Parliament by Lord Northbrook. Our expenditure on construction in the present year is nearly as 3 to 2 when compared with the French. I think it ought to be as 4 to 2.

We have leeway to make up in ship construction.

The comparison of ships has shown that we have leeway to make good, both in battle-ships and in fast cruisers. While it is necessary to ask for additional money, it will conduce materially to economy if we build fewer small and slow vessels and concentrate our efforts on the finest and fastest vessels the constructors of the period can produce. The Estimates, in their improved form, give a return showing the first cost of construction of all the ships—effective and non-effective—on the strength of the Navy, under their years of completion.

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Table XIII.

In the twenty years, 1867–88, the aggregate cost of the armoured ships was £22,195,485; the protected £753,718; the partially protected, steaming over 14 knots, £825,289; and the torpedo-cruisers and torpedo-gunboats, £948,171. The ships in these classes are those on which alone we could reckon as effective for war service. In the same period the cost of other vessels, constructed mainly for peace purposes, was over £12,000,000. We must to some extent build for the police of the seas, and the service of the ports. We have gone too far in this direction in the past.

Cost of ships built in years 1867–88 mainly for peace purposes.

Having now reviewed our present strength and our past expenditure, I address myself to the more practical and more difficult task of suggesting a programme for the future.

Lord Brassey's programme.

I would place in the very front of those requirements for which a special grant should be asked the work, too long delayed, of putting our existing fleet of effective ships in a condition to render service. We have been habitually remiss in the repair of boilers. A large proportion of our ships in commission are worked at a reduced pressure, and are quite unable to maintain the speed for which they were designed. There are some gratifying exceptions. The Alexandra, the flag-ship of the Duke of Edinburgh, is a pattern of what ought to be done and can be done to maintain the speed of a first-class man-of-war. In the manœuvres of last year it was a sorry sight to see the Rupert and the Black Prince left behind, the one in Lough Swilly and the other at Berehaven. Nearly a thousand men were practically *hors de combat*, because their ships could not keep up with the fleet. The French have not allowed their ships to lose speed through worn-out boilers. Admiral Krantz, the present Minister of Marine, has signalised his administration by taking in hand every ship that France now has in reserve and making her fit for service. The desirability of re-boilering the Northumberland class has already been insisted upon. All our ironclads not of the most recent date should be similarly treated. With triple-expansion engines and modernised armament, they would be well able to meet the ironclads of other powers of the same period and the same type. In the event of war, the latest ships would not be spared from European waters for expeditions to distant seas. I strongly recommend the grant of a million and a-half for the essential work of rehabilitating and bringing up to modern requirements numerous ships, which, for certain important duties of the Navy, are only obsolete in their machinery and armament.

Repairs and refits.

There is little room for difference of opinion as to the necessity for making good the long arrears of repairs and refits. When we turn to

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the consideration of the amount of new construction required, it is far more difficult to be precise. Civilians can but compare and collate the advice tendered to the country by the gallant officers of the Navy, and by those men of science whose skill in invention has created an enormous difficulty for the naval administration of the present day.

Programme of new ships.

In suggesting a programme of new construction, it will be necessary to begin with the battle-ships. In war the place of the British ships would be in the face of those of the enemy, wherever they might be. The British ships must never lose sight of the enemy. Once separated, it becomes impossible to conjecture his destination. Nelson's famous chase of Villeneuve is an example of the perplexities of a great sea-officer when attempting a pursuit without information. If we have commanding strength, the enemy will retire into port and await the chance of sending a fast vessel to sea from time to time to make raids upon our trade. In this case the British squadron of the future will have to perform the same duty which was undertaken in the days of our forefathers—they will have to keep watch from the offing. They must be prepared at any moment for battle in numbers sufficient to make sure of victory. This was Nelson's principle. How seriously the difficulty of maintaining a close blockade has been enhanced by the introduction of steam was explained by Sir Geoffrey Hornby in his paper read in May last before this Chamber. This difficulty was shortly afterwards illustrated in practice in the manœuvres on the coast of Ireland. To maintain a blockading squadron of a given strength off a port, under the conditions of steam, Admiral Hornby told us that there should be a force in reserve equal to the number present off the enemy's port. The blockading ships must draw constantly on their supplies of coal, and must be relieved at frequent intervals.

Duties of a British squadron.

Nelson's principle.

Sir Geoffrey Hornby.

Adopting Admiral Hornby's view, it is evident that we have no sufficient superiority to provide for an effective blockade of the ships of a single Power, still less of those of a combination of Powers. In numbers and tonnage, the ships in the Tables I. and II. show a near approach to equality, and it is important to remember that the force of the combined Powers includes a larger proportion of modern ships than we could muster under the British flag. Strength for battle is, in the opinion of all naval officers, the first consideration. A reinforcement of our fleet with four first-class ironclads and ten vessels of the second-class, as proposed by Lord Charles Beresford, cannot be regarded as an exaggerated demand. We may take the cost of building, as estimated by Lord Charles Beresford, at

Lord Charles Beresford's programme.

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£7,500,000. The time required to complete would be from three to four years. How is the money to be provided, say in four years?

For the building of armoured vessels in 1888–9, we have taken in the Navy Estimates, £753,000, as against £702,867 taken in the French Estimates for the same service. In four years our present appropriation would give us, roughly, £3,000,000 for building ironclads. We require, therefore, a special grant of £4,500,000, spread over four years.

Financial effect of Lord Brassey's programme.

In addition, I have proposed to spend £1,500,000, spread over three years, for necessary repairs of the older ironclads. Thus the special programme described would add to the present estimates for three years £1,625,000, and for a fourth year £1,125,000. The special programme being completed, under normal conditions, we should do twice as much as the French in the construction of battle-ships.

Unarmoured vessels.

Turning from ironclads to unarmoured vessels for protection of commerce, what are the duties which the Navy might be called upon to undertake? Under the apprehension of war with Russia, the Admiralty, of which I had the honour to be a member, dispatched British cruisers to watch every port where a cruiser under the Russian flag was to be found. As in the case of battle-ships, so in the case of cruisers, to seal up the enemy would clearly be the most effective method of giving protection to our trade. It has, however, been made clear in the manœuvres, both at Berehaven and at Lough Swilly, that a blockade can hardly be so close as to render it impossible for fast vessels to escape. For this contingency further provision must be made. Sir Arthur Hood told a Committee of the House of Commons that the Navy ought to be able to protect certain great routes along which our trade passes. Admiral Hornby specially directed attention, in his paper of last year, to the trade with the East by the Cape and Suez Canal. He proposed a plan of protection by groups of ships operating from well-chosen strategical positions, and suggested that at certain points on the route up the Mediterranean convoys might be resorted to. Admiral Hornby made a formidable demand for numerous cruisers. Our existing force is a small instalment of what Admiral Hornby asked for, and showed to be desirable. By recent efforts, however, we have greatly strengthened our fleet in cruisers. Our rate of building, as proposed in the Estimates for 1888–9 is double that of France. See Table XII. We may perhaps rest content if this ratio is maintained. We could build with the present provision two first-class cruisers, Blake or Warspite type, four Merseys, and ten Sharpshooters, annually.

What was made clear by the Naval Manœuvres of 1888.

Sir Arthur Hood.

Admiral Hornby.

Comparative rate of building.

In connection with the defence of commerce it would be absolutely

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necessary to retain the command of the Channel and its approaches. For this duty we must rely on ships of greater power than cruisers. The special programme of armoured construction will give a valuable reinforcement in the class of vessels we should most need for the protection of our trade in the Channel and along the entire route to the Suez Canal.

Battle ships.

In considering the programme of unarmoured building, the valuable assistance to be obtained from the mercantile marine for its own protection against merchant steamers converted into cruisers cannot be put out of view. All the leading maritime powers—Italy, Germany, the United States, and France — have by liberal subsidies given encouragement to the building of steamships capable of conversion into cruisers. The present Government have wisely adopted a similar policy. At a relatively small cost, amounting for the present year to £26,000, six ships of exceptional speed have been specially retained for the public service. Nine others are also at the disposal of the Admiralty. In the two new White Star liners the construction has been specially considered with reference to protection in case of war service. These ships are of about 10,000 tons, divided by longitudinal bulkheads running the entire length of the ships, above the water-line. They are propelled by twin screws. The stearing gear, engines, and boilers are below the load water-line. It would always be advantageous for the Admiralty to come to terms with shipowners in the early stage of the construction of ships, with the view to secure the best constructive arrangements at the cheapest cost. Following the plan which has been initiated in the case of the White Star line a really effective reserve may gradually be created for the defence of commerce against privateers.

Mercantile auxiliaries.

Subsidies.

The new White Star ships.

I frankly confess that it is with sincere reluctance that I lend as much support as I am able to give to the demand for an increase of expenditure—even on the Navy. To spend vast sums on preparations for war, is to deprive peace of half its blessings. As a politician I could not reconcile it to my sense of duty to come here to urge proposals prompted merely by a spirit of aggression; but when the forward movement has been taken elsewhere, and it has become evidently necessary to strengthen the fleet for the defence of the Colonies, and the vast interests created by our peaceful and beneficent enterprise, as carriers of the trade of the world, the question presents itself under a different aspect. If we ask ourselves why the special programme produced by Lord Northbrook, and that which, as we anticipate, will be laid before Parliament by the present Admiralty,

Reluctance to ask for increased expenditure.

Lord Northbrook's programme.

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Reluctance to ask for increased expenditure.

Lord Northbrook's programme.

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are necessary, the answer is to be found in a retrospective view of our expenditure in the past.

Our relative expenditure on new construction dangerously near that of France.

I have quoted the authority of Lord George Hamilton, to the effect that for a period of six years our expenditure was in dangerous approximation to that of the French. In 1884 we had much lee-way to make up. Lord Northbrook partly made good what was wanting. There is still a wide gap in our armour which should be filled up. The country has been prepared for the demand we are now pressing on the Admiralty by the voice of the Chancellor of the Exchequer. In a speech lately delivered at Birmingham he appealed to the patriotism of the democracy, reminding us in words of truth and eloquence that you cannot have Empire without sacrifice. In a later speech, addressed to a metropolitan audience, Mr. Goschen insisted on the change in our position. We were being forced more and more into contact with neighbours in all parts of the globe. We had no jealousy; but we did intend to maintain our position as the first colonial empire in the world.

Mr. Goschen.

Tribute to the Admiralty staff.

In my opening words, I paid to those who have been working for the Navy outside the Admiralty the tribute they deserve. It would be unfair and ungenerous to render no acknowledgment to the seamen and civilians who have been serving their country with untiring devotion and conspicuous ability in the present Board of Admiralty. They have passed through an ordeal of examination and cross-examination before Committees and Commissions, such as their predecessors have never had to face, and they have come out of it with credit. They have done the best that could be done with the resources placed at their disposal. The initiative in any great movement of extension must always come from the country.

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TABLE I.—BATTLE SHIPS

Launched 1878 *to* 1888.

ENGLAND.				FRANCE.				RUSSIA.			
Date.	Name.	Displacement.	Speed.	Date.	Name.	Displacement.	Speed.	Date.	Name.	Displacement.	Speed.
		Tons.	Knots.			Tons.	Knots.			Tons.	Knots.
1888	Nile	11,940	16·5	1887	Neptune	10,581	15·0	1888	Nicholas I.	8,000	16·0
1887	Trafalgar	11,940	16·5	1887	Marceau	10,581	15·0	1887	Alexander II. ..	8,440	15·0
1887	Victoria	10,470	16·7	1886	Hoche	10,581	15·0	1887	Tchesmé	10,800	15·0
1887	Sanspareil	10,470	16·7	1885	Formidable ..	11,380	15·0	1887	Sinope	10,800	15·0
1886	Anson	10,600	16·7	1885	Caïman	7,200	14·5	1886	Ekaterina II. ..	10,800	15·0
1885	Camperdown ..	10,600	16·7	1885	Requin	7,200	14·5				
1885	Howe	10,300	16·7	1883	Amiral Baudin	11,380	15·0				
1885	Hero	6,200	15·5	1883	Indomptable ..	7,200	14·5				
1885	Benbow	10,600	16·7	1881	Terrible	7,200	14·5				
1884	Rodney	10,300	16·7	1881	Courbet	9,700	15·0				
1882	Collingwood ..	9,500	16·4	1879	Dévastation ..	10,100	15·1				
1882	Colossus	9,420	15·4	1879	Amiral Duperré	11,100	14·2				
1882	Edinburgh	9,420	15·4								
1881	Conqueror	6,200	15·5								
1880	Ajax	8,660	13·0								
1879	Agamemnon ..	8,660	13·0								
	Total 16 Ships	155,280			Total 12 Ships	114,203			Total 5 Ships	48,840	

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TABLE II.—BATTLE SHIPS

Launched before 1878, *and reckoned effective.*

ENGLAND.				FRANCE.				RUSSIA.			
Date of Launch.	Name.	Displacement.	Speed.	Date of Launch.	Name.	Displacement.	Speed.	Date of Launch.	Name.	Displacement.	Speed.
		Tons.	Knots.			Tons.	Knots.			Tons.	Knots.
1876	Inflexible	11,880	13·8	1877	Triomphante ..	4,700	12·9	1872	Peter the Great ..	9,340	14·0
1876	Téméraire	8,540	14·6	1876	Redoubtable ..	9,200	14·6	1867	Kniaz Pojarsky ..	4,500	10·5
1875	Dreadnought ..	10,820	14·2	1876	Trident	8,800	14·1				
1875	Superb	9,170	13·2	1875	Colbert	8,400	14·4				
1875	Alexandra	9,490	15·0	1875	Victorieuse	4,600	12·7				
1874	Neptune	9,310	14·2	1873	Friedland	8,300	13·3				
1872	Thunderer	9,330	13·4	1873	Richelieu	9,100	13·1				
1871	Devastation ..	9,330	13·8	1872	La Galissonnière	4,700	13·1				
1870	Sultan	9,290	13·5 (*a*)	1870	Suffren	7,600	14·3				
1870	Swiftsure	6,910	13·7	1869	Marengo	7,900	13·5				
1870	Triumph	6,640	13·5	1868	Océan	7,500	13·7				
1870	Iron Duke	6,010	12·5 (*a*)	1863	Héroine	5,887	13·0				
1869	Audacious	6,010	13·2 (*a*)								
1869	Invincible	6,010	13·8 (*a*)								
1868	Monarch	8,320	14·9								
1868	Hercules	8,680	13·6 (*a*)								
1865	Bellerophon ..	7,550	14·2								
	* Total 17 Ships	143,210			Total 12 Ships	86,687			Total 2 Ships	13,840	

N.B.—The hulls of all the Battle Ships launched for the British Navy in the period 1868-77, are of iron. With the exception of the Redoubtable and Friedland, all the French ships are of wood.

(*a*) Deduced.

* If the Sultan is not raised, the number of ships would be reduced to 16, and the number of tons displacement to 133,920.

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TABLE III.—BATTLE SHIPS

Not Effective unless Repaired. *Sans Valeur Sérieuse.*

ENGLAND.					FRANCE.				
Date of Launch.	Material of Hull.	Name.	Speed.	Displacement.	Date of Launch.	Material of Hull.	Name.	Speed.	Displacement.
			Knots.	Tons.				Knots.	Tons.
1868	Wood	Repulse	12.3	6,190	1872	Wood	Bouledogue	12·2	3.505
					1871	Wood	Tigre	12·1	3,500
1865	Wood	Lord Warden	..	7,840	1870	Wood	Bélier	12·3	3,600
					1863	Wood	Montcalm	11·7	3,840
1863	Iron	Valiant	..	6,710	1867	Wood	Thétis	12·0	3,621
					1865	Wood	Taureau	12·5	2,700
1862	Iron	Hector	12·4	6,710	1865	Wood	Revanche	13·2	5,819
					1864	Wood	Savoie	13·4	5,819
1861	Iron	Defence	..	6,270	1863	Iron	Onondaga	7·0	2,590
		Total 5 Ships	..	33,720			Total 9 Ships	..	34,989

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TABLE IV.—COAST DEFENCE

Ships Completed and Completing after Launching.

ENGLAND.			FRANCE.			RUSSIA.		
Date of Launch.	Name.	Displacement.	Date of Launch.	Name.	Displacement.	Date of Launch.	Name.	Displacement.
		Tons.			Tons.			Tons.
1879	Orion	4,870	Building	Phlegeton	1,640	1868	Admiral Spiridoff ..	3,740
1876	Belleisle	4,870	,,	Styx	1,640	1868	Admiral Greig ..	3,593
1872	Rupert	5,440	,,	Grenade	1,050	1868	Admiral Chichagoff	3,511
1871	Cyclops	3,480	1887	Cocyte	1,639	1867	Admiral Lazareff ..	3,536
1871	Hecate	3,480	1886	Mitraille	1,045	1865	Kreml	3,412
1871	Hydra	3,480	1885	Achéron	1,639	1864	Netron Menya ..	3,370
1871	Gorgon	3,480	1885	Flamme	1,045	1863	Pervenets	3,279
1870	Hotspur	4,010	1884	Fusée	1,045			
			1883	Furieux	5,700			
			1880	Tonnant	4,707			
			1878	Vengeur	4,523			
			1877	Fulminant	5,600			
			1876	Tempête	4,523			
			1875	Tonnerre	5,700			
	Total 8 Ships ..	33,110		Total 14 Ships ..	41,496		Total 7 Ships ..	24,441

SUMMARY.—France and Russia, 21 ships, 65,937 tons displacement. England, 8 ships, 33,110 tons displacement.

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TABLE V.—HARBOUR DEFENCE.

Ships Completed.

ENGLAND.				RUSSIA.			
Date of Launch.	Name.	Speed.	Displacement.	Date of Launch.	Name.	Speed.	Displacement.
		Knots.	Tons.			Knots.	Tons.
1871	Glatton	12·1	4,910	1875	Admiral Popoff	7·0	3,550
1870	Magdala	10·4 (a)	3,340	1873	Novgorod	7·0	2,500
1870	Abyssinia	9·6 (a)	2,900	1867	Charodeika	8·5	2,026
1870	Cerberus	9·75	3,480	1867	Rusalka	8·5	1,960
1867	Penelope	12·7	4,470	1864	Vestchun	7·0	1,565
1865	Viper	9·6	1,230	1864	Uragan	7·0	1,565
1865	Vixen	8·9	1,230	1864	Tifun	7·0	1,565
1864	Prince Albert	11·3	3,880	1864	Strelets	7·0	1,565
1863	Scorpion	10·5	2,750	1864	Perun	7·0	1,565
1863	Wivern	10·1	2,750	1864	Lava	7·0	1,565
				1864	Latnik	7·0	1,565
				1864	Koldun	7·0	1,565
				1864	Edinorog	7·0	1,565
				1864	Bronenosets	7·0	1,565
				1864	Smertch	8·2	1,530
	Total 10 Ships	.. ..	30,940		Total 15 Ships	.. ..	27,216

(a) Deduced.

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TABLE VI.—CRUISERS—ARMOURED.

N.B.—The lists for France and Russia are taken from the return moved for by Lord Charles Beresford. To the British ships included in the list, the iron-clads of the period 1860–66, have been added. With triple-expansion engines they are capable of steaming 16 knots, with good coal endurance.

ENGLAND.				FRANCE.				RUSSIA.			
Date of Launch.	Name.	Displacement.	Speed.	Date of Launch.	Name.	Displacement.	Speed.	Date of Launch.	Name.	Displacement.	Speed.
		Tons.	Knots.			Tons.	Knots.			Tons.	Knots.
1887	Galatea	5,600	18·5	1883	Dugnesclin	5,900	14·0	1884	Admiral Nakhimoff ..	7,780	16·0
1887	Aurora	5,600	18·5	1882	Vauban	5,900	14·0	1883	Vladimir Monomakh	5,796	15·4
1887	Immortalité ..	5,600	18·5	1880	Bayard	6,000	14·5	1882	Dimitri Donskai ..	5,796	16·2
1886	Orlando	5,600	18·5	1879	Turenne	6,400	14·1	1878	Minin	5,740	12·9
1886	Australia ..	5,600	18·5					1875	Duke of Edinburgh ..	4,600	13·0
1886	Narcissus ..	5,600	18·5	Building	Dupuy de Lôme ..	6,300	20·0	1873	General Admiral ..	4,600	13·0
1886	Undaunted ..	5,600	18·5	,,	N.	6,300	20·0	Building	Pamyat Azova	6,000	17·5
1884	Warspite	8,400	16·7	,,	N. (reported additional to programme in estimates for 1889)	6,300					
1884	Impérieuse ..	8,400	16·7								
1886	Nelson	7,630	14·0								
1886	Northampton ..	7,630	13·2								
1885	Shannon	5,390	12·3								
1886	Northumberland	10,780	14·1								
1885	Agincourt ..	10,690	14·8								
1883	Minotaur ..	10,690	14·4								
1883	Achilles	9,820	14·3								
1881	Black Prince ..	9,210	13·6								
1880	Warrior	9,210	14·1								
	Total 18 Ships	137,050			Total 7 Ships ..	43,100			Total 7 Ships ..	40,312	

N.B.—The material of hull for all the British and Russian ships, and for the Vauban and Duguesclin, is iron and steel. The Turenne and Bayard are wood built.

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TABLE VII.—CRUISERS.—UNARMOURED.

Completed and Completing.

N.B.—All the cruisers of 16 knots and over are built of steel or iron. For the inferior speeds the material of hull is given in a separate column.

	ENGLAND.				FRANCE.				RUSSIA.			
	Date.	Name.	Displacement.	Speed.	Date.	Name.	Displacement.	Speed.	Date.	Name.	Displacement.	Speed.
			Tons.	Knots.			Tons.	Knots.			Tons.	Knots.
20 knots and over.	1888	Medusa	2,800	20								
	1888	Medea	2,800	20								
		2 Ships	5,600									
19-20 knots.	1888	Marathon ..	2,950	19¾	1888	Cecile	5,766	19·0	1887	Admiral Korniloff	5,029	18
	1888	Magicienne ..	2,950	19¾	1888	Troude	1,847	19·5				
	1888	Melpomene ..	2,950	19¾	1888	Lalande	1,847	19·5				
					1888	Cosmao	1,847	19·5				
					1888	Coetlagon ..	1,818	19·5				
					1888	Forbin	1,850	19·5				
					1886	Tage	7,045	19·0				
		3 Ships	8,500			7 Ships ..	22,020			1 Ship	5,029	
18-19 knots.	1878	Mercury	3,730	18·0	1884	Milan	1,540	18·0				
	1877	Iris	3,730	18·0								
		2 Ships	7,460									
17-18 knots.	1887	Serpent	1,770	17·5 to 18·0	1887	Faucon	1,280	17·0 to 18·0				
	1887	Racoon	1,770	17·5 to 18·0	1886	Epervier	1,280	17·0 to 18·0				
	1886	Brisk	1,770	17·0	1885	Condor	1,280	17·0 to 18·0				
	1886	Mohawk	1,770	17·0								
	1886	Porpoise	1,770	17·0								

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CRUISERS—UNARMOURED—(*continued*).

Completed and Completing.

	ENGLAND.					FRANCE.					RUSSIA.			
	Date.	Name.	Displacement.	Speed.		Date.	Name.	Displacement.	Speed.		Date.	Name.	Displacement.	Speed.
			Tons.	Knots.				Tons.	Knots.				Tons.	Knots.
	1886	Cossack	1,770	17·0										
	1886	Tartar	1,770	17·0										
	1886	Fearless	1,580	17·0										
	1886	Forth	4,050	17·0										
	1885	Thames	4,050	17·0										
	1885	Mersey	4,050	17·0										
	1885	Severn	4,050	17·0										
	1885	Alacrity	1,700	17·0										
	1885	Scout	1,580	17·0										
	1885	Archer	1,770	17·0										
		15 Ships ..	35,220				3 Ships ..	3,840						
				Speed.	Material of Hull.				Speed.	Material of Hull.				
16–17 knots.	1885	Surprise	1,650	16·8	S	1884	Sfax	4,488	16·0	S				
	1883	Phæton	4,300	16·5	S	1876	Duquesne ..	5,800	16·9	C				
	1883	Amphion ..	4,300	16·5	S	1876	Tourville ..	5,600	16·9	C				
	1882	Leander	4,300	16·5	S									
	1882	Arethusa	4,300	16·5	S									
	1873	Shah	6,250	16·2	C									
	1868	Inconstant ..	5,780	16·2	C									
		7 Ships ..	30,880				3 Ships	15,888						

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15–16 knots.	1876	Bacchante ..	4,130	15·1	C	1887	Duguay Trouin	3,300	15·9	C	1885	Rynda	2,950	15·0
	1873	Raleigh	5,200	15·3	C	1880	Nielly	2,300	15·0	C	1884	Vitiaz	2,950	15·0
	1869	Volage	3,080	15·1	C	1879	D'Estaing ..	2,400	15·3	C				
	1869	Active	3,080	15·1	C	1874	Dupetit Thouars	2,000	15·0	W				
						1874	Seignelay ..	1,900	15·0	W				
						1869	Hirondelle ..	1,869	15·5					
		4 Ships.. ..	15,490				6 Ships.. ..	13,766				2 Ships.. ..	5,900	
14–15 knots.	1888	Daphne	1,140	15·0	S	1884	Dubourdieu ..	3,400	14·0	W	1880	Pamyat Merkuriya	3,050	14·0
	1888	Nymphe	1,140	15·0	S	1882	Aréthuse	3,400	15·0	W				
	1887	*Buzzard ..	1,140	15·0	S	1882	Roland	2,300	14·0	C	1878	Zabiyaka ..	1,234	14·0
	1877	Euryalus ..	4,140	14·7	C	1882	Primauguet ..	2,400	15·0	C				
	1875	Boadicea	4,140	14·7	C	1881	Iphigenie ..	3,200	14·0	W				
	1874	Rover	3,460	14·5	C	1881	Magon	2,300	14·0	C				
						1881	Naïde	3,500	14·0	C				
						1879	Forfait	2,400	14·0	C				
						1879	Villars	2,400	14·0	C				
						1877	Laperouse ..	2,400	14·0	C				
						1876	Rigault-de-Genouilly	1,710	14·3	C				
						1872	Champlain ..	2,000	14·0	W				
						1870	Sané	1,900	15·0	W				
						1868	Châteaurenault	1,850	14·2	W				
						1868	Eclaireur ..	1,830	15·0	W				
						1866	Desaix	1,683	14·2	W				
		6 Ships.. ..	15,160				16 Ships ..	38,673				2 Ships.. ..	4,284	
				Cost. £										
13–14 knots.	1884	Calypso	2,770	165,552		1872	La Clocheterie	2,100	13·7					
	1884	Pylades	1,420	82,071		1872	Duchaffault ..	1,340	12·7					
	1883	Calliope	2,770	157,930		1872	Kerguelen ..	1,340	12·7					
	1883	Rapid	1,420	73,644		1869	Infernet	1,936	13·9					
	1883	Royalist	1,420	78,357										
	1882	Caroline	1,420	81,002										

* Buzzard class has been added to the list of cruisers.

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CRUISERS—UNARMOURED—(*continued*).

Completed and Completing.

	ENGLAND.				FRANCE.				RUSSIA.			
	Date.	Name.	Displacement.	Cost.	Date.	Name.	Displacement.	Speed.	Date.	Name.	Displacement.	Speed.
			Tons.	£			Tons.	Knots.			Tons.	Knots.
	1881	Cordelia	2,380	130,875								
	1881	Canada	2,380	131,565								
	1881	Satellite	1,420	68,056								
	1881	Heroine	1,420	73,297								
	1881	Hyacinth ..	1,420	73,210								
	1880	Constance ..	2,380	123,015								
	1878	Cleopatra ..	2,380	122,681								
	1878	Curaçoa	2,380	121,596								
	1878	Conquest	2,380	123,044								
	1878	Champion ..	2,380	122,903								
	1877	Garnet	2,120	102,288								
	1876	Emerald	2,120	107,424								
	1875	Opal	2,120	102,824								
	1874	Sapphire	1,970	86,899								
		20 Ships ..	40,470	2,128,233		4 Ships	6,716					
12–13 knots.	1878	Comus	2,380	123,913	1874	Fabert	2,100		1881	Opritchnik ..	1,335	
	1878	Carysfort	2,380	123,678	1872	Beautemps-Beaupré	1,350		1880	Vestnik	1,335	
	1876	Turquoise ..	2,120	105,244					1880	Strélok	1,335	
	1876	Ruby	2,120	102,024					1879	Plastun	1,335	
	1875	Tourmaline ..	2,120	103,429					1877	Razboynik ..	1,335	
	1874	Diamond	1,970	85,770					1878	Nayézdnik ..	1,335	
									1879	Africa	2,852	
									1876	Djigit	1,335	
									1875	Kreyser	1,335	
									1874	Asia	2,483	
		6 Ships	13,090	644,058		2 Ships	3,450			10 Ships ..	16,015	

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TABLE VIII.—CRUISERS—UNARMOURED.

On the Stocks.

Speed.	ENGLAND. Name.	Displacement.	FRANCE. Name.	Displacement.	RUSSIA. Name.	Displacement.
22 knots	Blake	9,000				
	Blenheim	9,000				
20 knots	Vulcan (Torpedo depôt ship)	6,620				
19·5 knots	Barham	1,830				
	Bellona	1,830				
19 knots	*Pandora	2,575	Ialy	4,160		
	*Pelorus	2,575	Jean Bart	4,160		
	*Persian	2,575	Alger	4,160		
	*Phœnix	2,575	Davoust	2,977		
	*Psyche	2,575	Suchet	2,977		
			Surcouf	1,850		
18 knots			Vautour	1,280	N	4,300
			Wattignies	1,280		
16·5 knots	Blanche	1,580				
	Blonde	1,580				
	Barracouta	1,580				
	Barrosa	1,580				
	Total 14 Ships	47,475 tons	Total 8 Ships	22,844 tons	Total 1 Ship	4,300 tons

* Australasian Squadron.

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TABLE IX.—TORPEDO VESSELS.

Completed, completing and building.

ENGLAND.				FRANCE AND RUSSIA.				
Date of Launch.	Name.	Speed.	Displacement.	Date of Launch.	Name.	Flag.	Speed.	Displacement.
		Knots.	Tons.				Knots.	Tons.
Building	Spanker	21·0 (*b*)	735	Building	Kapitan Saken	R	20·0	600
„	Speedwell	21·0 (*b*)	735	1886	Ilyin	R	20·0	600
„	*Whiting	21·0 (*b*)	735	1886	Lance	F	19·5	320
„	*Wizard	21·0 (*b*)	735	1886	Salve	F	19·5	320
1888	Sharpshooter	21·0	735	1885	Bombe	F	19·5	320
1888	Salamander	21·0 (*b*)	735	1885	Couleuvrine	F	19·5	320
1888	Seagull	21·0 (*b*)	735	1885	Dague	F	19·5	320
1888	Sheldrake	21·0 (*b*)	735	1885	Dragonne	F	19·5	320
1888	Skipjack	21·0 (*b*)	735	1885	Flèche	F	19·5	320
1887	Grasshopper	19·0 (*b*)	525	1885	Sainte-Barbe	F	19·5	320
1887	Sandfly	19·0 (*b*)	525	1877	Vzryv	R	17·0	134
1887	Spider	19·0 (*b*)	525					
1886	Rattlesnake	18·5 (*b*)	550					
1881	Polyphemus	17·8	2,640					
1874	Vesuvius	9·7	245					
	Total 15 Ships	..	11,620		Total 11 Ships	..	..	3,894

* Australasian squadron. (*b*) Estimated.

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TABLE X.—COMPARATIVE STATEMENT SHOWING EXPENDITURE ON CONSTRUCTION OF NEW VESSELS, HULLS AND MACHINERY, IN ENGLAND AND FRANCE, FROM 1863-64 TO 1888-89.

Year.	England.	France.	Year.	England.	France.	Year.	England.	France.
	£	£		£	£		£	£
1863-64	1,282,710	920,196	1872-73	809,087	614,460	1881-82	1,682,500	1,400,152
1864-65	1,674,574	873,300	1873-74	1,290,028	789,684	1882-83	1,767,014	1,559,644
1865-66	1,116,198	931,348	1874-75	1,528,161	921,380	1883-84	1,930,090	1,536,508
1866-67	1,014,406	875,468	1875-76	1,613,218	1,054,560	1884-85	2,242,070	1,510,704
1867-68	1,800,749	797,104	1876-77	2,121,960	1,301,988	1885-86	3,737,000	1,355,684
1868-69	1,694,362	668,780	1877-78	2,922,442	1,501,884	1886-87	3,495,000	1,280,000
1869-70	1,387,047	655,016	1878-79	1,508,049	1,504,656	1887-88	3,058,000	2,510,020
1870-71	1,330,814	411,948	1879-80	1,388,607	1,375,296	1888	3,061,000	1,848,980
1871-72	1,184,172	429,832	1880-81	1,426,349	1,345,084	1889	..	1,759,684

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TABLE XI.—AGGREGATE COST OF CONSTRUCTION OF EFFECTIVE SHIPS.

Completed 1867–68 *to* 1887–88 *under the year of their completion.*

	Armoured.		Protected and partially protected.		Torpedo cruisers and Gun-boats.		Total cost of ships completed.	
	Direct.	Incidental.	Direct.	Incidental.	Direct.	Incidental.	Direct.	Incidental.
	£	£	£	£	£	£	£	£
1867–68	53,457	3,216	..	..	..	..	1,070,510	199,009
1868–69	1,350,691	134,899	..	..	..	..	1,761,578	215,399
1869–70	371,415	107,556	..	..	..	..	738,323	168,127
1870–71	714,259	68,129	..	..	..	..	931,103	95,220
1871–72	773,873	165,219	..	..	..	..	869,171	183,557
1872–73	267,718	5,451	..	..	..	..	410,739	41,619
1873–74	771,258	76,152	..	..	..	..	1,042,523	132,472
1874–75	239,197	61,570	..	..	..	..	745,174	175,148
1875–76	..	..	..	..	..	..	49,018	60,190
1876–77	682,626	119,404	..	..	..	..	1,036,029	177,786
1877–78	1,461,069	238,785	..	..	..	..	2,412,722	338,869
1878–79	886,918	119,024	123,913	4,157	128,517	5,060	2,136,367	283,681
1879–80	414,434	13,374	368,177	13,154	..	..	1,394,813	142,937
1880–81	531,846	24,816	122,681	4,759	..	..	975,823	53,050
1881–82	1,912,964	179,368	246,059	31,834	..	..	2,426,215	251,943
1882–83	296,761	4,696	366,758	87,032	..	..	851,046	103,676
1883–84	..	..	204,775	46,547	..	..	680,953	101,564
1884–85	530,015	104,527	73,644	17,733	..	..	933,253	166,788
1885–86	1,222,499	206,566	1,279,454	188,280	..	..	2,515,754	395,398
1886–87	2,225,759	332,405	190,291	8,717	93,920	4,781	2,982,845	407,864
1887–88	5,006,605	516,964	640,117	113,601	853,272	94,899	6,755,804	750,750
	19,713,364	2,482,121	3,615,869	515,814	1,075,709	104,740	32,719,763	4,445,047

Total cost—Armoured	£22,195,485		
Protected and partially protected	4,131,683		
Torpedo cruisers and gun-boats	1,180,449		
		£27,507,617	
First cost of all ships completed 1867–68 to 1887–88			£37,164,810
Cost of effective combatant ships—			
Armoured ships	22,195,485		
Protected ships, Polyphemus, Mersey, Severn, and Thames ..	753,718		
Partially protected ships over 14 knots	825,289		
Four ships, Leander type			
Torpedo-cruisers and gun-boats	948,171		
			24,722,663
Expenditure in the period 1868–88 on ships not effective for battle or protection of commerce in war			£12,442,147

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TABLE XII.

Comparison of Expenditure on Shipbuilding—British and French Navies, 1889.

		ENGLAND.		FRANCE.	
		No. of Ships.	Expenditure.	No. of Ships.	Expenditure.
			£		£
Armoured..	Battle Ships	11	602,577	7	473,839
	Cruisers	7	153,614	2	139,328
	Armoured Gun Boats	Nil.		3	89,700
	Total	18	756,191	12	702,867
Unarmoured	First-class Cruisers, Torpedo / Depôt Ship and Frigates	3	375,434	5	411,532
	Second-class Cruisers	6	386,965	2	93,300
	Third-class Cruisers	7	256,200	6	168,798
	Sloops	5	133,650	Nil.	Nil.
	First-class Gunboats	15	330,604	Nil.	Nil.
	Torpedo Cruisers	Nil.	Nil.	2	58,221
	Torpedo Gunboats	10 and 2 ordered	252,524	Nil.	Nil.
	Torpedo Sloops	Nil.	Nil.	2	56,800
	Torpedo Boats	16	81,050	63	138,372
	Surveying Ships, Sailing Brig and Yard Craft	..	70,341	3 Sailing Frigates	6,156
	Sundry expenditure including sum for gun mountings	..	57,311	Sundries.	123,638
	Total Unarmoured		1,944,079		1,056,817
	Total Armoured from above		756,191		702,867
	* Total New Construction as given in Navy Estimate		2,700,270		£1,759,684
	Australasian Squadron		360,730		
	* Grand Total as given in First Lord's Memo. to the Committee on Navy Estimates in Session of 1888.		£3,061,000		

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TABLE XI.—AGGREGATE COST OF CONSTRUCTION OF EFFECTIVE SHIPS.

Completed 1867–68 *to* 1887–88 *under the year of their completion.*

	Armoured.		Protected and partially protected.		Torpedo cruisers and Gun-boats.		Total cost of ships completed.	
	Direct.	Incidental.	Direct.	Incidental.	Direct.	Incidental.	Direct.	Incidental.
	£	£	£	£	£	£	£	£
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1872–73	267,718	5,451	..	..	..	..	410,739	41,619
1873–74	771,258	76,152	..	..	..	..	1,042,523	132,472
1874–75	239,197	61,570	..	..	..	..	745,174	175,148
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1883–84	..	..	204,775	46,547	..	..	680,953	101,564
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1885–86	1,222,499	206,566	1,279,454	188,280	..	..	2,515,754	895,398
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	19,713,364	2,482,121	3,615,869	515,814	1,075,709	104,740	32,719,763	4,445,047

Total cost—Armoured	£22,195,485		
Protected and partially protected	4,131,683		
Torpedo cruisers and gun-boats	1,180,449		
		£27,507,617	
First cost of all ships completed 1867–68 to 1887–88			£37,164,810
Cost of effective combatant ships—			
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Protected ships, Polyphemus, Mersey, Severn, and Thames ..	753,718		
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	Second-class Cruisers	6	386,965	2	93,300
	Third-class Cruisers	7	256,200	6	168,798
	Sloops	5	133,650	Nil.	Nil.
	First-class Gunboats	15	330,604	Nil.	Nil.
	Torpedo Cruisers	Nil.	Nil.	2	58,221
	Torpedo Gunboats	10 and 2 ordered	252,524	Nil.	Nil.
	Torpedo Sloops	Nil.	Nil.	2	56,800
	Torpedo Boats	16	81,050	63	138,372
	Surveying Ships, Sailing Brig and Yard Craft	..	70,341	3 Sailing Frigates	6,156
	Sundry expenditure including sum for gun mountings	..	57,311	Sundries.	123,638
	Total Unarmoured		1,944,079		1,056,817
	Total Armoured from above		756,191		702,867
	* Total New Construction as given in Navy Estimate		2,700,270		£1,759,684
	Australasian Squadron		360,730		
	* Grand Total as given in First Lord's Memo. to the Committee on Navy Estimates in Session of 1888.		£3,061,000		

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IV.

Reduction of Small Vessels on Foreign Stations. Concentration of Expenditure on Vessels Effective for War.

Speech by compiler, House of Lords, July 9th, 1888.

LORD BRASSEY rose to call attention to the foreign squadrons and to the large expenditure on ships not effective for the operations of war or the protection of trade. He said that he disavowed all intention to criticise the present Admiralty, which had rendered excellent service to the country. His object was to propose a change of system, to increase the building of effective ships by diminishing expenditure on those which were comparatively ineffective. The experience of the last two years must have impressed on all who were interested in the Navy the imperative necessity of concentrating our efforts on essentials. Under a Government which could not be suspected of indifference to the security of the Empire we had seen a sweeping reduction of Navy Estimates. He did not condemn the Admiralty for accepting reductions, or the Government for showing some distrust of the assurances so glibly given in various quarters that the country was ready to spend unlimited amounts on the increase of the Navy. The experience of every Chancellor of the Exchequer was the same. Proposals to build ships and to raise seamen were popular enough. There was always some fatal objection to new taxes. Impressed with the difficulty of increasing estimates, while at the same time earnestly desiring to obtain more protection for our commerce, he would consider the means—in effect the only means—by which the object in view could be attained. It was not necessary to make exaggerated statements as to the inferiority of the British Fleet in comparison with other Powers. In the construction of swift and powerful vessels great progress had been made within a recent period. In vessels built or completing we had established a decided superiority. When, however, we turned to the programme of building now in course of execution in France and England, it was evident that our position in the future was seriously threatened. Setting aside the torpedo gunboats, which

A change of system proposed.

Examination of programme of ships now building in France and England.

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were in no sense cruisers, the English programme of shipbuilding for 1888–9 included the two first-class cruisers, Blake and Blenheim, 9000 tons, 22 knots; the five second-class cruisers, M type, 2900 tons, 20 knots; and two third-class cruisers, 1800 tons, 19·5 knots. The French shipbuilding programme was much more ambitious. It included the 20-knot ships Dupuy de Lôme, belted cruiser, 6360 tons; and the Davoust and Suchet, protected cruisers, 3027 tons. Their list of 19-knot vessels included 11 ships—Tage, 7045 tons, Cécille, 5766 tons, three Alger type, 4162 tons, and six third-class cruisers, Surcouf type, 1850 tons. Of ships steaming 19 knots and over, France was building 14, England 9. Making full allowance for greater rapidity of construction, when we looked to the vessels in progress in France and to the figures recently published by Lloyd's, showing the approximate value of our mercantile marine to that of France as £93,000,000 to £9,000,000, we saw that greater efforts were required on the part of the British Admiralty. As an immediate step Sir Arthur Hood recently asked for six additional cruisers. The question to be considered was how such a reinforcement of the Fleet might be obtained with the least charge to the public. When we were building for the protection of commerce speed was the first condition of efficiency, and we were now, as in the past, wasting money in building too many cruisers greatly inferior in speed to those building in France. We were building four third-class cruisers of the Barossa class—1580 tons, 16·5 knots. No figure was named for those ships in the Estimates; but the cost could not be less than £400,000. Then there were the five ships of the Buzzard class, 1140 tons, 14·5 knots, and the Melita, 12·5 knots, costing, in round figures, £65,000 each. There were also 15 gunboats of the Pheasant type—13 knots; cost, £41,000. In all we had in hand 25 comparatively slow vessels, which would cost in the aggregate at least £1,405,000. France had only five vessels of the corresponding class. The cost would be under £400,000. We were spending on cruisers conspicuously inferior to those building for France, Italy, and the United States a sum which would have given us ten more 20-knot cruisers of the Medea class; and it was not open to question that such an addition to the Navy would have been more valuable for the protection of commerce than any number of gunboats. All that unsatisfactory expenditure on peace-service vessels to which he had referred did not fall on the Estimates of the current financial year; but the proportion chargeable to 1888–89 formed a serious deduction from the money available for building effective ships. Excluding indirect charges, £2,667,000 was taken

Greater efforts required by the British Admiralty.

Ships building of low speeds.

How money spent on building slow ships could have been spent with more advantage.

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for new construction in 1888–89. An analysis showed that the expenditure on ships designed for war service, including the armoured and protected vessels over 19 knots and the torpedo flotilla, was £1,944,814. Surveying and other necessary services absorbed £101,000. Thus far the appropriation of the shipbuilding vote was entirely satisfactory. What was not satisfactory was that we should spend no less than £621,520 on protected vessels under 17 knots and unprotected vessels under 15 and 14 knots. The excessive construction of vessels of inadequate speed was not a new defect in our naval administration. The extent of this drain on our resources was shown in some striking figures presented to Parliament with the Navy Estimates of this year. Taking the period from 1867–68 onwards, our total expenditure on shipbuilding was £33,134,851. Looking through the figures in detail, it was painful to see that millions had been sunk in corvettes, sloops, and small vessels designed only for peace requirements, not suitable by reason of insufficiency of speed for the protection of commerce, and not powerful enough for the line of battle. Our larger partially protected ships approached very near in the cost per ton to some of our most powerful ironclads, and in the last ten years we had completed 16 such vessels of the Comus and Satellite types, none having a speed of more than 13 knots. Eleven corvettes of somewhat inferior speed had been built, the earliest having been completed in 1870. Since 1872 we had built 19 sloops, 15 gun vessels, and 28 cruising gunboats, with speeds ranging from 14 knots in the latest to under 10 knots in the earlier types. The total cost of these vessels was no less than £5,483,733. The cost of maintenance after completion to the 31st of March, 1887, was given at £1,385,000; and if we added the dockyard incidental charges apportioned to each ship, amounting to over £1,018,610, we arrived at a total expenditure in the period subsequent to 1865 amounting to £7,887,522. It was because we had been building so many vessels adapted only to peace requirements that we were driven, when the prospect of a conflict with Russia seemed imminent, to take up at great cost for conversion into cruisers merchant steamers absolutely unprotected and weakly armed, but possessing the speed which was indispensable, and in which the ships built for the Navy were wanting. That unhappy experience should not be renewed. They had been more successful in France in checking unprofitable expenditure on what had been happily described as the *poussière navale*. Of 13 to 14 knot vessels France had four and England 26. Of vessels of 13 down to 10 knots France had 43 and England 52.

The expenditure which was not satisfactory.

Review of the results of our expenditure since 1867–68.

Action taken when a conflict with Russia seemed imminent.

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Under 10 knots France had 15 and England 69. Mere harbour-service craft were not included on either side. It was worthy of notice that our numerical superiority increased as we descended in quality. No Administration would willingly have incurred a large and continuous expenditure on vessels known when they were laid down to be practically useless in war. We had been building, and we were now building, to satisfy demands pertinaciously pressed upon the Admiralty for the display of the flag in every quarter of the globe where we had commercial interests to protect and Consuls to represent us, no matter how inferior the vessel upon which it was borne. How seriously our Administration was hampered by these impolitic requisitions was readily seen upon an examination of the squadrons on foreign stations. Taking the numbers as they stood at a recent date, of ships steaming 17 knots and over we had nine as against two French ships. Of the ineffective class steaming 14 knots and under, our ships in commission were 63 to 29 under the French flag. These numbers were exclusive of 11 tenders to our reserve ships and the gunboats attached to our home ports. Where we were dealing with savage races, as in the Eastern Archipelago or the Pacific, the mere display of the flag was sufficient for the maintenance of order. With civilized nations, however, it was not the flag but the effective power of which it was the symbol which alone produced any sensible impression. France was the only foreign Power which had attempted to follow our system of maintaining numerous small vessels in every quarter of the globe, and her policy in this regard was condemned by her most distinguished officers. Nothing existed in our naval administration for which no good reason could be given at the time when it was established; but many things were survivals of the past, and not suited to present conditions. That was eminently true in relation to our foreign squadrons. The excessive number of small vessels under the British flag on foreign stations originated in the building of gunboats by hundreds in the Crimean war for service in the Baltic. Having these gunboats on our hands, the desire to find a use for them was natural, and at a time when communication was slow and difficult, it was desirable to keep vessels near at hand to give protection to British interests. With the introduction of the telegraph and steam the conditions were altered. The policy which we should follow in the altered circumstances of the case was well described in a letter which he (Lord Brassey) had received from Sir Spencer Robinson. Instead of showing our flag in slow and inefficient but costly vessels scattered singly over the globe, squadrons of swift and powerful vessels

Number of our ships increased as the speed decreased.

The mere display of the flag was sufficient for uncivilized nations.

Our foreign squadrons.

Conditions altered with introduction of steam and the electric telegraph.

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should be kept ready at home and at certain stations abroad within reach of the telegraph, and thence despatched to the place where a naval force might be required. Flying squadrons under the British flag should occasionally visit every sea. If a question were raised as to the means by which officers and men would be trained when the small vessels were reduced, the answer was that there was little to stimulate energy, no emulation, and but limited opportunity for gaining professional knowledge in scattered vessels of inferior type. The instruction of the Navy would be best carried on in flying squadrons, in training squadrons, and by an annual mobilisation, such as the present Board of Admiralty had twice carried out to the great advantage of the service. He should be glad to learn that the Admiralty had resolved on some revision of the programme of building now before Parliament. It would be satisfactory to receive the announcement that those fast cruisers were about to be ordered which Sir Arthur Hood was so desirous to lay down. As an immediate practical step he would urge that our naval requirements abroad should be specially considered at the Foreign and Colonial Offices. As a result of such an examination he looked for the gradual withdrawal of some 30 or 40 small craft. With Estimates framed in anticipation of peace we must look for the means of strengthening our position not so much to an increase of expenditure as to efficient administration. He submitted the case, which he had endeavoured to state as clearly and plainly as he could, with confidence to the deliberate consideration of the Government.

How training could be best carried out.

Sir Arthur Hood.

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FOREIGN SQUADRONS of FRANCE and ENGLAND.—COMPARISON of SPEED of SHIPS in COMMISSION.

Speed.	Cape.		S. E. America.		Mediterranean.		E. Indies.		N. America.		Pacific.		China.		Australia.		Channel.	
	British.	French.	British.	French.	British.	French.	British.	French.	British.	French.	British.	French.	British.	French.	British.	French.	British.	French.
Knots.																		
17 and over .	..	..	..	..	4	1	..	..	..	..	..	..	4	..	1	..	..	..
15–16 . . .	1	..	..	..	..	..	..	1	..	..	..	1	..	..	..	..	..	1
14–15 . . .	..	1	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..
13–14 . . .	..	..	1	..	..	..	..	..	..	..	2	..	5	..	1	..	..	..
12–13 . . .	3	..	1	..	1	1	3	1	5	..	1	1	..	..	4	2	..	..
11–12 . . .	2	1	..	..	4	..	4	1	1	2	2	1	2	2	..	..	..	..
10–11 . . .	..	1	..	1	2	3	3	2	1	1	..	..	..	..	..	..	..	..
9–10 . . .	1	..	..	..	2	..	..	2	2	..	1	..	5	4	2	..	..	..

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Knots.																		
17 and over .	..	..	..	..	4	1	..	..	..	..	..	..	4	..	1	..	..	..
15–16 . . .	1	..	..	..	..	..	..	1	..	..	..	1	..	..	..	..	..	1
14–15 . . .	..	1	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..
13–14 . . .	..	..	1	..	..	..	..	..	..	..	2	..	5	..	1	..	..	..
12–13 . . .	3	..	1	..	1	1	3	1	5	..	1	1	..	..	4	2	..	..
11–12 . . .	2	1	..	..	4	..	4	1	1	2	2	1	2	2	..	..	..	..
10–11 . . .	..	1	..	1	2	3	3	2	1	1	..	..	..	..	..	..	..	..
9–10 . . .	1	..	..	..	2	..	..	2	2	..	1	..	5	4	2	..	..	..

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V.

Recent Shipbuilding and Dockyard Administration.

Paper read by Lord Brassey, K.C.B., at the Royal United Service Institution, Friday, February 22, 1889, Admiral the Right Honourable the Earl of Clanwilliam, K.C.B., K.C.M.G., Member of Council, in the Chair.

HAVING dealt with the amount of building required in the Navy, in an address recently delivered at the Mansion House, I propose to-day to treat of our shipbuilding with reference to types, and to close with some remarks bearing on the efficiency of our dockyard administration. I am fully sensible that the undertaking is hazardous. I am encouraged to persevere by the controversies of the experts. It may be that a mere layman, after calmly hearing both sides, may reach conclusions not unworthy the consideration of those who, if they know more, are perhaps less able to be impartial.

I commence my task with a brief review of recent shipbuilding abroad and at home. Having traced the direction which contrivance and invention have lately taken, we may perhaps find some indications to guide us in our programme of shipbuilding for the near future.

A continuous belt general in French battle ships.

First, let us review the ships building abroad. In the class of battle-ships, France has adhered chiefly to a type much admired in our own Navy. The French ships are defended by a continuous belt, and they have the advantage of a high freeboard. In our ships the heavy guns are better protected, and recently we have established a decided superiority in speed.

Italian ships have no armour belts.

The Italian constructors, while building vessels of the largest dimensions as yet accepted, have thrown off belts, preferring other methods of protection for the vitals of ships. In armaments, and in armour for the protection of guns, in speed, and coal endurance, their ships are matchless.

Germany.

The Germans are imitators rather than pioneers in matters of construction.

United States.

The United States, after a long pause, are adding to their Fleet several ships, in which are combined the best features of recent construction

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elsewhere. The Russians are throwing their main efforts into turret-ships heavily armoured and armed.

Admiral class and the belted cruisers.

Neither abroad nor at home are the constructors allowed to pursue their way unchallenged by criticism. In England, among ships of recent construction, the Admiral class and the belted cruisers are the types which have been most criticized. These classes are so numerously represented in the Navy that it would be little short of a national disaster if we were driven to regard them as absolute failures.

Admiral class.

Of the Admiral class we have built six, and they have cost nearly four and a half millions sterling. Sir Edward Reed would remove the Admirals from our list of battle-ships on the ground of deficiency of protection at the water-line. Admiral Hood and Mr. White, in their evidence before the Select Committee on our Navy Estimates, refused to concur in this condemnation. Referring to the risks of the loss of stability by the penetration of the unarmoured sides near the water-line, Mr. White told the Committee that the Admiral class would fight with risks of the same kind as the ships with narrow belts of foreign navies. His views were confirmed by Admiral Hood, who said that, for the fighting purposes of a ship under the usual conditions as he found them at sea, his experience led him to the opinion that it was not of vital importance whether the upper edge of the belt was flush with the water or 18 inches above the water-line. Whilst expressing a favourable opinion generally of the Admiral class, Admiral Hood had considered it desirable to give more protection to the Nile and Trafalgar class, for the designs of which he was personally responsible. In these two ships the 20-inch steel-faced armour is reinforced by inner armour with a strong system of girder work. The armour is not only thicker, but it extends over an area of side considerably larger than in the case of the Admiral class. It is important to take note of the sacrifices required to secure this increased amount of armour. The tonnage has been raised from 10,600 to 12,000 tons, and the cost from £729,000 for each ship to £854,000. An addition of 1400 tons to the displacement, and an increased expenditure of £125,000, is the price which it has been necessary to pay for the additional defensive power of the Nile class. There has been no development of offensive power in the later ships. In point of speed and coal endurance, the Nile and Trafalgar are somewhat inferior to the Admiral class, although their armament is approximately the same.

Mr. White's evidence.

Admiral Hood.

Nile and Trafalgar.

A general summary of the fighting efficiency of the Admiral class was given by Mr. White, in answer to a question put by Mr. Maclean,

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Mr. White on the Admiral class.

a member of the House of Commons Committee. Mr. White pointed out that the Admiral class had an armament of unrivalled power. The disposition of the armament was, by the common consent of naval authorities at home and abroad, the best afloat. The guns were carried high above the water; the auxiliary armament was very powerful. The claim put forward for the Admiral class that they should be rated as battle-ships was not, in Mr. White's view, to be disallowed because their belts were narrow and did not go to the ends. His definition of a battle-ship was a vessel which, carrying heavy guns, has its auxiliary guns mounted in armoured stations and has the vitals efficiently protected. He considered that the Italian ships, the Sardegna, the Umberto, and the Sicilia, were battle-ships of the first rank. They had no side-armour, but they had strongly curved decks and a magnificent armament, all the heavy guns and the hydraulic and other mechanism necessary to the working being protected by thick armour.

It will be admitted that the Admiral class would be more satisfactory if they had more protection by armour. Keeping within the limits accepted as to size and cost, and having a fixed amount of weight available for armour, it might have been preferable to take something from the armour on the barbettes, in order to give more protection to the battery. It is questionable whether it would have been expedient to give an additional proportion of weight to the protection of the water-line.

Belted cruisers: Orlando class.

Let us pass on to the belted cruisers. Seven vessels of this type have been built at an expenditure of three and a half millions. The position of the belt has been made the ground of a severe condemnation of these vessels. The Admiralty witnesses were closely questioned by the Committee on the Navy Estimates as to the efficiency of the belted cruisers. Neither Sir Anthony Hoskins, nor Admiral Hood, nor Mr. White, concurred with the critics in attaching a vital importance to the position of the protective belt. Sir Anthony

Sir A. Hoskins.

Hoskins gave his views in the form of an argument. He did not think it wrong to send the ships to sea, though he would have wished that the mistake in the calculations for the construction of the ships had not been made; but, while making this admission, he urged that the armour belt was placed on the ship's sides for the protection of the vitals. As the ship goes down in the water, the vitals are submerged and thereby protected: as the ship lightens, and the vitals become exposed to shot, the belt also rises and gives protection. It is undesirable that a ship should have a greater draught than she is designed for, but in the case of the belted cruisers the vitals are

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equally protected, whether the armour is above or below the water-line.

In the important element of speed the belted cruisers have more than fulfilled the conditions laid down for the original design. Outside Plymouth breakwater, the force of the wind being 8, the Orlando steamed 13·8 with one-third power, 16 knots with two-thirds power, and 17·141 with forced draught. In the smooth water off the Maplin Sands the Immortalité did 19¼ knots with forced draught. The gunnery trials have been satisfactory. Belonging to the class of protected rather than armoured vessels, the belted cruisers do not seem to merit the condemnation which has been passed upon them for deficiency of armour. It is perhaps the greatest defect of this class that, as at present armed, they require a complement of more than 500 men. In war it would not be desirable to place such large numbers in a mere protected cruiser. All our cruisers, as Admiral Baird pointed out to the Committee on the Naval Manœuvres, are overloaded with armament. Mere weight of armament will not make an unarmoured ship a battle-ship; and if regarded, as they should be, as cruisers, our belted vessels are far more heavily armed than French cruisers of corresponding tonnage. The Cécille of 5766 tons, carries no gun heavier than the 5-ton gun. In the case of the Piemonte, recently purchased by Italy from the Armstrong firm, the armament was changed from heavy pivot guns to four 111-pounder, quick-firing guns, mounted on sponsons, two on the bow and two on the quarter. If the armaments were reduced the complements could be reduced. The comfort of the crews of Her Majesty's ships is not undeserving of consideration. Manned as at present, the belted cruisers are overcrowded, and the discomfort caused by the want of space is aggravated by insufficient ventilation. This should be, and can be, remedied. Defective ventilation is a frequent and a grave fault in our ships of war. It makes the heat below intolerable. The falling-off at sea from the speed at the measured mile is largely due to the closing up of openings in the course of the work of completing ships for commission.

Speed of the Orlando class.

Admiral Baird on weight of armaments.

Cécille.

Piemonte.

Of the vessels which have commanded general approval, it is not necessary to say much. The Victoria and the Sans Pareil are the most powerful single-turreted ships which have been built. They carry a pair of 110-ton guns in a single turret. The bow fire will be of crushing power. The auxiliary armament is very formidable; but the guns are fought behind easily penetrable armour. If shells are employed with high explosives, a corresponding defence by armour will be required for all the fighting positions in the ship.

Victoria and Sans Pareil.

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Minotaur's refit.

In reviewing our most recent proceedings in relation to shipbuilding, the decision taken by the Admiralty, as reported in the public prints, in relation to the refit of the Minotaur seems open to criticism. For war, the value of these ships depends mainly on their speed and coal endurance. In this regard they can never be satisfactory so long as their old-fashioned engines and boilers are retained. An expenditure of £50,000 is wasted on a policy of half measures. The *Times* correspondent at Portsmouth points out that the expenditure of fuel is, as compared with that of modern engines, enormous. The bunker capacity of the Minotaur is equal to 650 tons, and, as the engines consume about 4½ lbs. for every unit of horse-power developed per hour, she could only steam for 3½ days at a speed of 12½ knots, representing a radius of 1040 miles. The utmost consumption of coal by triple expansion engines is about 2½ lbs., so that, with the same amount of storage, modern engines would enable her to steam the same distance at little less than half the cost, or twice her present radius at the same cost of fuel, besides increasing her efficiency as a man-of-war. With triple expansion engines and suitable boilers, the ships would have a high speed and good coal endurance; with our old engines and old boilers they will have neither the one nor the other.

Blake and Blenheim.

In the cruisers laid down by the present Admiralty, speeds rarely attempted before in vessels of corresponding dimensions have been reached. In the Blake and the Blenheim the dimensions have been carried to 9000 tons. It has been found necessary to accept these unprecedented dimensions in order to secure decided superiority over the latest cruisers in construction abroad. Without entering into the details of the design, the Blake class may be regarded as a type of which we shall require more than two to give effective protection to our fleet along the great ocean highway to Australasia.

Gunboats: Pheasant class.

In the recent construction for the Navy, the building of gunvessels of the Pheasant class would seem to yield the least satisfactory results. The great improvements which mark the new class of gunboat will at once be admitted. It is sufficient to walk round the steam basin at Portsmouth, and to compare one of the new class with the Medway, to appreciate how great has been the advance in the later designs. It is, however, a question whether powerful cruisers, are not more necessary than gunboats for the reinforcement of the Navy. For the police of the seas we have no lack of vessels on the Navy List. If our gunboats are worn out or obsolete, it might have been feasible to utilize the corvettes of the Gem class and the C class. With reduced armaments and reduced complements our

Our corvettes might be used instead of building new gunboats.

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corvettes might have taken the place of the sloops, and our sloops might have relieved the gunboats.

The proposed programme.

Passing from ships lately built or building to the programme for the future, it should be the first object to strengthen the Fleet in the line-of-battle. In ships of the first class, offensive and defensive powers not inferior to those of the Nile and the Trafalgar will be insisted upon. The new vessels to be laid down should not be mere repetitions, but, if possible, improvements upon their predecessors. It would be a vast improvement if our battle-ships could be constructed with those lofty bows which give to ships of the Alexandra and Hercules type a conspicuous advantage over later models when steaming at speed against a heavy sea. Their great cost, falling little short of £800,000 for each battle-ship of the first class, renders it impossible to multiply such vessels beyond a certain limit. It is necessary to turn to smaller types, and of these none would appear to give greater promise than the armoured ram.

Armoured ram.

Dealing with a professional topic, it will be more impressive if the views of a layman can be conveyed in language borrowed from members of the naval profession. No navy has displayed more original genius in construction than that of the United States. In the Report of the Secretary for the United States Navy of 1870, the marine ram is alluded to as "a new element which promises, when constructed upon sound principles, and in forms of special strength for its particular and appropriate service, to be a weapon of most destructive warfare." The value of rams was specially insisted upon by the Admirals who had commanded during the Civil War, and who at its close were requested to draw up reports for the guidance of the Naval Department in relation to shipbuilding. Amongst these experienced sea-officers none perhaps wrote more clearly and more forcibly than Admiral Goldborough. Arguing that no ship of rational dimensions can support throughout her exposed parts more than a very limited thickness of iron plating, and that the strongest armour can be but of poor account unless other elements of efficiency, and notably that of celerity in turning, are secured, he insists that every ironclad, as a matter of course, should be an unexceptionable ram. This she could not be unless capable of being directed with a great degree of promptness to any desired quarter. Velocity was of primary importance; it made the vessel herself a terrific projectile. "The value of rams," he said, "at this moment cannot be overestimated. With a few in each of our prominent commercial ports no enemy could blockade them. Rams intended for purely harbour defence would be better without guns. They themselves would be

Admiral Goldborough on the value of rams.

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the projectile, the steam, the powder, and the effect of these properly combined would be absolutely irresistible. To fit the rams with guns would swell the cost largely, and so abridge the multiplication."

Admiral Gougeard's design for a ram.

Turning to the French Navy, the armoured ram was strongly recommended by Admiral Gougeard, the Minister of Marine under M. Gambetta. Admiral Gougeard's design, as described in the *Engineer*, was intended to be armed with the torpedo as the principal weapon, to have great speed, and to be protected by a steel deck; the floatability being guaranteed by means of cells filled with buoyant material. The type contemplated by Admiral Gougeard is represented in the British Navy by the solitary Polyphemus. A ship for the same purpose could be designed of a more solid and yet less costly construction. The superstructure could be simplified, the torpedo armament reduced, the thin but expensive armour of Whitworth steel plating being replaced by more solid but less costly armour.

That rams alone would not constitute a satisfactory or efficient fleet for the general duties of the Navy will be obvious. Enough, perhaps, has been said in support of a proposal that some vessels of this class should be taken in hand. In combination with our line-of-battle ships armoured rams would be of great value.

Cruisers.

Passing to the cruisers, the Blake and Blenheim have already been mentioned. In the construction of vessels of more moderate dimensions we have to make our choice between the various designs recently produced. We have in our own Leanders models of symmetry with great speed. Among cruisers lately built, of comparatively small dimensions, the Piemonte, as described by Lord Armstrong, is a vessel which presents a remarkable combination of armament and speed on a displacement of 2500 tons. The Medea and the Medusa, now completing for our own Navy, represent a satisfactory design for a swift cruiser of moderate dimensions. Fast cruisers of this type are essential in European waters. The swift sea-keeping torpedo gunboat is a type of vessel most valuable for the purpose of blockade, and as an auxiliary to the heavier ships. We need a large reinforcement of this class.

Leander class.

Piemonte.

Medea class.

Torpedo gunboat.

To conclude this part of my subject—assuming our normal expenditure on shipbuilding to be on the scale proposed in the address which I had the honour of delivering before the Chamber of Commerce—that is to say, double the amount of the appropriations in the French Estimates, and assuming our expenditure at the present time to be in round figures three millions annually, equally divided between the armoured and protected classes—our programme of con-

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struction should enable us to add every year to the Fleet the following list of vessels: one battle-ship of the first class, three armoured rams, two Blenheims, three Medusas and eight Sharpshooters. The shipbuilding policy for the British Navy must be adapted to the circumstances of the time, and it will always be possible, by means of a special effort to make additions to any particular class of ships in which it is thought that we are deficient. Supplementary Estimates on the one side must be met by Supplementary Estimates on the other.

The compiler's programme.

From shipbuilding I pass, by a natural transition, to the administration of those great establishments in which our ships are built. It has been the custom to hold up the dockyard administration to contempt. We have recently had a more favourable opinion, and from an authoritative source. The dockyard expense and manufacturing accounts, those important combinations of figures in which the whole results of the manufacturing operations of the dockyard are built up into a comprehensive balance-sheet, have lately, for the first time, been submitted to the searching audit of the Comptroller-General of the Exchequer. That high authority expresses satisfaction both with the principle on which those accounts are prepared and with their accuracy in detail. The results of a test audit lately for the first time applied by the Treasury to the Store Accounts are equally satisfactory.

Admiralty administration.

As to the comparative cost of dockyard and contract building, we have the evidence of the Director of Dockyards, who has come fresh to his post after a long and successful career in the private trade of the country. Asked his opinion by the Committee of the House of Commons on Navy Estimates, Mr. Elgar considered that, as the contractors could build a merchant ship more cheaply, so the dockyard had the advantage in building ships of war. He expressed himself well satisfied with the dockyard workmen both for skill and diligence.

Mr. Elgar's evidence.

As to the time occupied in building, we have achieved immense reform. We have been making steady progress for some years in accelerating construction; but the Trafalgar has eclipsed anything that had before been achieved. It is hoped that she will be ready for the pennant in June, or three years and six months from the time when the keel was laid. Certain it is that the British dockyards compare favourably with those under foreign administration. In Italy the Duilio and the Dandolo, laid down in January, 1873, were ready for commission in January, 1880, and March, 1882, respectively. The Italia and Lepanto, laid down in January and

Time occupied in building in England compares favourably with that in other countries.

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September, 1876, were ready for commission—the former in October, 1885, the latter in May, 1888.

Turning to the French Navy, the ironclads now in construction —the Neptune, laid down at Brest, and the Magenta at Toulon, in October, 1880—will not be ready for their trial before 1890. The Formidable laid down at L'Orient, and the Admiral Baudin at Brest, in December, 1878, will be ready for their trials in the present year. The Hoche and the Marceau—the one building in the dockyard and the other by contract—were both laid down in 1880. The Marceau will be ready this year. The Hoche is $\frac{23}{100}$ths short of completion. The delay in completing in France is more striking still in the case of smaller vessels. Of the four armoured gunboats laid down in 1882, one of 1640 tons and one of 1050 tons will be ready this year; another pair, one of larger and the other of smaller size, will be advanced to $\frac{49}{100}$ths and $\frac{41}{100}$ths respectively. The torpedo cruiser, the Vautour, of 1280 tons, commenced in 1882, was only completed for sea in 1888.

Relative cost of work.

It is difficult to compare the cost of work in the French and English dockyards. In the French dockyards the number of workmen is 21,000, and their average earnings are £40 a year. The number of workmen in the English dockyards is 18,047, and their average earnings exceed £65 a year. With this remarkable difference in the scale of the wages, the cost of building appears approximately the same in the two countries.

Dockyards and private yards compared.

In comparing a dockyard with a private establishment we must always keep in view that our establishments are primarily intended to deal with emergencies and for the general purposes of the Fleet. There must be a larger expenditure on various services than is strictly necessary to carry out the work of mere building in ordinary times. In late years, more particularly under the present Board of Admiralty, improvements have been effected in dockyard administration. While recognizing that much has been achieved, there is still room for improvement. Money is wasted on the maintenance of ships practically useless for the defence of our shores and our commerce in the event of war. The steam basins have been filled with vessels efficient only for peace purposes, in process of refitting at great cost for the relief of other vessels of similar type, which it has been the inherited policy of the Government to keep in commission for the police of the seas. Progress has been made in cutting down the cost of repairs and refits. For a further and considerable retrenchment we must look to a radical reform in the constitution of our foreign squadrons. On the Australasian station and China no

Improvement suggested.

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material reduction may be possible. On the East Indian station the trying work of the Red Sea, or some portion of it, should be handed over to the Indian Navy. Lascars are better fitted to contend with the climate than crews of Englishmen. Elsewhere the vessels permanently kept on the stations should be reduced. Our flag should be shown, and the Navy should be trained in flying squadrons. A system similar to that so long maintained in the British service has been followed under the French administration, and it has been most strongly condemned by the ablest naval writers in France.

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VI.

Extracts from the Statement of the First Lord of the Admiralty, explanatory of the Navy Estimates, 1888-89.

Special Australasian Squadron.

Colonial Conference.

At the Colonial Conference, held in London during 1887, a special agreement was entered into between the Home Government and the representatives of the Australasian Colonies, under which a joint financial responsibility was established between the contracting parties for the creation and maintenance of a sea-going squadron of ships of war to protect the commerce of the Empire in Australasian waters. The peculiarity of the arrangement consisted, not merely in the establishment of a financial partnership between England and Australasia for this specific purpose, but in the apportionment of the liability so incurred. The mother country engaged to bear the whole cost of building, arming, and equipping the squadron. On the other hand,

The agreement.

the Colonies undertook, when the vessels were commissioned, to meet the whole cost of their maintenance and manning up to a maximum of £91,000 annually during time of peace, and to pay in addition a sum of £35,000 annually for ten years, as a contribution towards the original cost of construction. The type, size, and special qualities of the vessels to be built will be hereafter described. They will cost, when complete, between £800,000 and £900,000. Special provision will be made to meet this liability under Act of Parliament, the clauses of which will explain the financial arrangement proposed. It

Sum to be spent in 1888-89.

is estimated that from £450,000 to £500,000 will be required to meet the cost of building these vessels during the financial year 1888-89,

In 1889-90.

and a somewhat lesser sum during the following year 1889-90, to complete and render them ready for commission. The ships will be thus built and completed in two years. At the end of that time, the ships being in commission, an annual sum of £91,000 towards maintenance will be paid by the Colonies as an appropriation in aid of Navy Votes, and Naval Funds will for ten years subsequently receive this assistance. In like manner the Imperial Exchequer will be credited for ten years with an annual payment of £35,000. By promptly performing our portion of the bargain, and paying for it in two years,

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the Navy will be augmented at the end of that period by seven efficient modern sea-going ships, and naval funds will then have a contribution for ten years to come in reduction of the sums annually voted by the Imperial Parliament. On the termination of the ten years the vessels will become the exclusive property of the British Government.

Steaming Trials of Ships in Commission.

In order to test thoroughly the steaming capabilities of new ships, orders were given last year to make trials extending continuously over four days, the machinery being worked by the ordinary complements of the ships. Trials such as these, made on foreign stations, with the bottoms of the ships in various conditions and under different circumstances of wind and weather, are of value chiefly as indications of the power that can be developed continuously, and are not evidences of the speeds which the vessels can attain under the most favourable conditions. It is satisfactory to report that no less than 70 to 80 per cent. of the contract horse-power developed on the measured mile, or 6 hours' contractors' trials, has been developed under the severer conditions of 96 hours' continuous steaming.

New Ships to be Built.

After completing the seven armoured ships nearing completion, there will remain in hand the following armoured vessels when the next financial year closes :—

Victoria,	Nile,
Sanspareil,	Trafalgar ;
Aurora,	

and of these the first three will be approaching completion, while considerable expenditure will still have to be incurred on the Nile and Trafalgar.

No Iron clad to be laid down in 1888–89.

The Board, therefore, decided not to lay down during 1888–89 any new ironclads. They propose, however, to re-engine the Superb and Thunderer, and to re-arm the latter. Provision for these purposes has been made in this year's Estimates.

Excluding for the moment the special squadron for Australasian service, the following are the new vessels to be built in 1888–89 :—

9 Protected Ships :—	
First Class Cruisers	2
Torpedo Depot Ship and Torpedo Boat-Carrier	1
Third Class Cruisers—	
Steel-Bottomed	2
Sheathed and Coppered	4

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14 Unprotected ships :—

Sloops (Buzzard type)	2
Gunboats* (Rattler type, improved)	6
Torpedo Gunboats (Sharpshooter type)	6
1 Sailing Brig (for training boys)	1
	24

All these vessels, with the exception of one first-class and one third-class cruiser, and two composite gunboats, will be built in the Dockyards.

The special squadron for service in Australasian waters is to consist of—

5 Protected Cruisers (new design),
2 Torpedo Gunboats (Sharpshooter type).

7

It is proposed to construct these seven vessels by contract.

The total number of vessels to be laid down is 31, comprising an aggregate displacement of 60,000 tons.

Description of New Designs.

After fully considering all the vessels of the cruiser classes in existence building, or proposed for Foreign Navies, and those completed or in progress for the Royal Navy, it has been decided to construct two vessels (Blake and Blenheim) which shall surpass in speed, coal endurance, protection, and armament, anything hitherto attempted. Their dimensions are—

Blake and Blenheim.

Length	375 feet.
Breadth	65 „
Displacement (about)	9,000 tons.
Speed (with full coal supply) on measured mile	22 knots.
At sea (continuous steaming)	20 „
Radius of action—	
Speed of 10 knots, about	15,000 „
Speed of 20 knots, about	3,000 „

The armament will be definitely determined when the trials of the larger kinds of quick-firing guns, now in progress, have been completed. Provisionally it includes—

2 9·2-in. (22 ton) bow and stern chasers,
10 6·in. (5 ton) quick-firers, broadside,
18 3-prs. quick-firers,
4 Torpedo tubes.

* This is independent of the 3 gunboats of this type ordered to be laid down at Pembroke in September 1887, and not included in the original programme of that year.

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The supply of ammunition to the quick-firing guns will be of very exceptional amount; and the weight assigned to the armament considerably in excess of that in any other cruiser.

The protective steel deck will extend throughout the length, and over the machinery, boilers, &c.; and will have a maximum thickness of 6 inches, and a minimum of 3 inches.

This maximum thickness of 6 inches will afford the same protection from the direct blows of projectiles as would a vertical plate of 12 inches in thickness.

The coal endurance, based upon the supply that is to be carried at the maximum speeds, is very nearly double that provided for in other cruisers; and compares even more favourably with the endurance of nearly all foreign cruisers. For the service intended this is a matter of primary importance.

The propelling engines will be of the vertical triple-expansion type, and many new features, tending to the efficiency of the vessels when employed at speeds varying over the great range of 10 knots to 22 knots per hour, will be introduced into the arrangements of engines, boilers, and coal stowage.

The condition of steaming continuously for long periods and over great distances at the very high speed of 20 knots per hour has been made a ruling condition in the design. With forced draught spurts of several hours' duration will be possible up to 22 knots.

In the maintenance of these high speeds at sea the great length (for a war-ship), and considerable size of the vessels, will obviously be of marked advantage.

As compared with previous cruisers these vessels are of large displacement, but taking into account their qualities above mentioned—speed, armament, coal endurance, and strong protection—they are not large vessels; and as compared with mercantile steamers having ocean speeds of 16 to 20 knots per hour, built or building, the new cruisers are of small size.

As protectors of commerce against regular or improvised cruisers, these vessels will be most useful; and for many other services they will prove valuable additions to the Fleet.

It is proposed to push on their construction as rapidly as is possible.

Torpedo Depot Ship and Torpedo Boat-Carrier Vulcan.

Hecla. The value of the Hecla torpedo depot ship as an adjunct to our principal squadrons has been most thoroughly demonstrated during the last ten years. The Hecla, as is well known, was purchased from

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the Mercantile Marine and adapted as a torpedo depot and store ship. She was also equipped for carrying a number of second-class torpedo boats. A careful study of the work done by the Hecla, and of the conditions now regarded as essential in a vessel capable of doing similar work, preceded the preparation of the design of the vessel about to be laid down at Portsmouth. This design is altogether novel in character, and has been worked out in the utmost detail during the last two years.

Vulcan. The Vulcan may be briefly described as a swift protected cruiser, lightly armed, with a large coal endurance; fitted with special appliances for lifting and carrying a considerable number of the largest type of second-class torpedo boats; while, in addition, she will be equipped with laboratory, workshop, a powerful torpedo armament, a large supply of torpedoes, stores, submarine mines, and electrical appliances of all kinds. She will be capable of protecting herself against all except the largest classes of cruisers. Her speed will exceed that of most cruisers and all armoured vessels. She will be a base of operations for a torpedo boat flotilla or the torpedo boats of a fleet; will have the means of repairing torpedoes, torpedo boats, and their machinery; will be a practice ship for all kinds of torpedo work—submerged and above water—and will carry all the gear required for submarine mining operations on a large scale.

The principal dimensions are:—

Length	350 feet.
Breadth	58 ,,
Displacement (about)	6,600 tons.
Speed (with full coal supply)—	
On measured mile	20 knots.
At sea (continuous steaming)	18 ,,
Radius of action—	
Speed of 10 knots (about)	12,000 knots.
Speed of 18 knots	3,000 ,,

Armament:—

8 36-prs. (quick-firers).
12 3-prs. ,, ,,
4 to 6 Torpedo tubes.

The protective steel deck will extend throughout the length, and over machinery, boilers, &c., will have a maximum thickness of 5 inches, and a minimum of 2½ inches.

Hydraulic power is to be applied throughout the vessel on a large scale, for lifting the boats and doing all kinds of work.

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Third-Class Cruisers.

Two types of these cruisers have been decided upon, identical in armament, rig, and protection, but differing in structure, propelling machinery, and boilers, speed, and coal endurance.

Blanche class.

For distant service on stations where docking accommodation does not exist, or may not be available in time of war, it has been decided to build four vessels (Blanche class), having their steel hulls sheathed with wood, and coppered. These vessels will have only light fore-and-aft steadying sails.

Their dimensions are:—

Length	220	feet.
Breadth	35	,,
Displacement (about)	1,600	tons.
Speed (with full coal supply)—		
On measured mile	16½	knots.
At sea (continuous steaming)	15	,,
Radius of action at 10 knots (about)	3,500	,,

Armament:—

6 36-prs. (quick-firers).
4 3-prs.
2 Torpedo tubes.

The protective steel deck will extend throughout the length, and have (over vitals) a maximum thickness of 2 inches, and a minimum of 1 inch.

The engines will be of the vertical triple-expansion type, and the boilers of the ordinary return tube marine type. Twin screws will be adopted as in all other modern cruisers.

For service from a base, such as in the Channel Squadron, or the Mediterranean, it has been decided to construct two steel-bottomed third-class cruisers (Bellona class), which (as explained above) resemble the Blanche class in armament and protection, but have higher speed. In these vessels the modified locomotive type of boiler, which has achieved success in the torpedo gunboats, will be fitted. A maximum speed of 19½ knots will thus be secured. The vessels will be about 50 feet longer than the Blanche class, and of 200 tons greater displacement. Their coal endurance at 10 knots will be about 2600 knots.

Torpedo Gunboats (Sharpshooter Type).

Sharpshooter class.

This is also a new design, the leading features of which have been already described. Its preparation completes a series of new designs

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for vessels of altogether exceptional speed and armament, which have engaged the close attention of the Director of Naval Construction and his Department for more than a year, and have involved a very large amount of labour and discussion. Taking these new types in association with previous cruiser designs, it appears that there has been effected a virtual reconstruction of the cruiser classes, as will be evident from the following summary:—

——	Tons.	Maximum Speed.
		Knots.
Protected.—Blake class	9,000	22
„ Vulcan class (torpedo depot ship) .	6,600	20
Armour Belted.—Orlando class . . .	5,600	18·5
Protected.—Mersey class	4,000	18
„ Medea class :	2,800 to 3,000	20 to 19¾
„ For Australasian service . .	2,500	19
„ Bellona class	1,800	19½
„ Blanche class	1,600	16½
Unprotected.—Archer class	1,770	17
„ Rattlesnake class . . .	550	18½ to 19
„ Sharpshooter class . . .	730	21

Of these new types all the designs have been prepared within the last two years, except those for Orlando, Mersey, Archer, and Rattlesnake classes. The completion and trials of these vessels will be pressed forward with all possible despatch.

Sloops, Beagle and Basilisk.

Beagle and Basilisk.

These vessels are to be practically reproductions of the Buzzard, and are specially intended for service on distant foreign stations. They are twin-screw unprotected sloops of about 1150 tons displacement, and 14½ knots measured mile speed, with 160 tons of coal on board. Including the Swallow, which has been in commission for some time, there are four vessels of the class built and building. The two new vessels are to be built with steel hulls, wood sheathed, and coppered; their predecessors are composite-built. They will have a fair amount of sail, but this is auxiliary only to their steam power.

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Gunboats (Magpie Class).

Magpie class.

The policy of the Board in regard to the smaller vessels of the Navy was last year fully explained, but it may be as well to briefly recapitulate.

The magnitude and variety of our trade and commerce, and the overwhelming proportions of our sea-going tonnage as compared to that of any other country, impose upon the Navy of this country active duties abroad of a very exceptional character. The functions thus discharged by our Fleet are a national necessity, and the benefits derived from the adequate performance of the work are ubiquitous, and shared in by foreign nations. Yet the dangers from which our commerce was to be protected in war time so differ from those against which they are guarded during peace, that it is no easy matter to make the whole of our Navy equally available and efficient for the discharge of both duties. Vessels of light draught and small displacement can, to a certain extent, be utilised for both purposes, provided they are armed with the most effective of modern guns and have a certain speed. Their number must, however, be curtailed; otherwise too large a proportion of our naval expenditure will be absorbed in vessels the employment and utility of which during war must be confined to a very limited sphere of action.

Functions of our Fleet for peace purposes.

The Board, finding it necessary to replace the obsolete gunboats and ships now serving abroad, determined to build a limited number of gunboats of an exceptionally powerful type in order that they might be able to fulfil the conditions described.

Nine additional gunboats have, therefore, been ordered. They are practically identical with the vessels of the Pheasant class; but, in order to provide for the 4 per cent. "margin for contingencies" ordered by the Board, they have been made 1 foot broader and of about 50 tons greater displacement than the Pheasant.

Loss of the Wasp.

The Board's decision on this matter was arrived at in full view of the circumstances attending the sad loss of the Wasp, so far as those circumstances can ever be known. Having carefully reconsidered all the particulars of her design in comparison with the corresponding particulars for preceding classes of gunboats, whose performances during a period of thirty years have been found most satisfactory, the Board reached the conclusion that the Wasp was in all features affecting seaworthiness and safety far superior to the gunboats which preceded her; and that there was no reason for modifying the design of the Pheasant and Magpie classes.

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The opinion of the naval members of the Board, after a full and exhaustive inquiry into the subject, was that they considered the design quite satisfactory.

These gunboats will be substituted for the various types and classes of gun vessels and gunboats now in commission, none of which it is proposed to reproduce.

Australasian Squadron.

Australasian squadron.

Of the seven vessels to be built for this special service, five are to be protected cruisers and two torpedo gunboats.

It has been decided that the latter shall be built from the Sharpshooter design.

Pandora class.

The protected cruisers will in their principal dimensions closely approximate to the Medea class of the Royal Navy. They will be of about 2500 tons displacement, have a maximum speed of 19 knots, and be identical in protection with the Medea class.

Their armament will include—

8 36-prs. (quick-firers).
8 3-prs. „ „
4 Torpedo tubes.

In the discussions which took place at the time of the Colonial Conference these vessels were described as Improved Archers. The substantial character of the improvement will be seen from the statement that the new vessels will possess the following advantages over the Archers:—

2 knots higher speed.
A strong protective deck.
A more modern armament; about 10 per cent. heavier in its total weight.
A radius of action about 30 per cent. greater.

It is anticipated that all these vessels will be ready for service within two years from the date of order.

Estimated Tonnage to be Completed.

Tonnage in three years.

It is estimated that the following is the amount of displacement tonnage which for the three years ending April, 1890, will be passed into the Fleet ready for commission:—

1887–88.	1888–89.	1889–90.
75,000	77,000	*75,000

* Inclusive of Australasian Squadron.

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Of this tonnage the following amount belongs to Lord Northbrook's Special Programme :—

1887–88.	1888–89.	1889–90.
21,800	16,800	21,500

All vessels designed during the present year have a margin unappropriated for contingencies of 4 per cent. upon their displacement. The Board have adopted this regulation to provide for unforeseen contingencies or weights added during construction, and to keep the vessel to the designed draught, and thus prevent the deeper immersion which the additional weights, for which no allowance has been made, must otherwise cause.

NAVAL ORDNANCE.

Transfer of Naval Ordnance to Naval Votes.

The recent re-organization of the War Office Department, under which a separation was made between the civil departments which manufacture, and the combatant branches which use the articles so manufactured, facilitated the transfer to the Navy Estimates of the charge hitherto borne on Army Votes for Naval Ordnance. Though the Board of Admiralty have assented to the change, they have done so with some hesitation. The information supplied to them, both as to existing stock and outstanding liabilities, is imperfect, from the difficulty the War Office has experienced in apportioning from stocks held in common for both services, and contained in store-houses scattered over the world, the exact amount to be credited to the Navy. Until the Admiralty are in complete possession of such information, though ready to account for and explain the vote so transferred, they cannot make themselves responsible for its adequacy. The sum proposed to be taken is, judging from past experience, as much as can be earned by the existing gun factories in the country, and should be more than sufficient to meet the normal wants of the year. Whatever deficiency of stores may exist at the commencement of the financial year should therefore be diminished at its close, and the maintenance of the Ordnance vote at its present high figures for a few years to come should bring up to the requisite standard the reserves of ammunition and stores. In the course of the year complete information on this point will be obtained, and the Board of Admiralty will regulate their action accordingly.

During the year ending December 31st, 1887, 238 new breech-

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loading guns have been issued to the Navy, including two 16¼-inch guns of 111 tons, and four 13½-inch guns of 69 tons.

In addition to these 238 guns, 123 new guns, including one 16¼-inch and eleven 13½-inch guns, may be completed by the end of March, 1888. This will still leave 254 guns under order, exclusive of fresh guns, to be obtained in 1888–89.

Delay on account of guns.

Considerable delay has occurred in the delivery of guns at the dates previously promised. Several of the heavier ironclads are now awaiting their armament, and the programme of Dockyard work has been deranged, and the cost of completing ships has been increased by these delays. So few breech-loading guns of large calibre have hitherto been made in this country, that all concerned in their manufacture, whether they be private contractors or Woolwich manufacturers, seem to have antedated the finish of their work and miscalculated the time necessary for its completion. As experience is gained, it is to be hoped that punctuality of delivery will be associated with it, and that one of the main impediments now existing to the passing of ships rapidly into the First Reserve, as ready for service, will be removed.

New mountings.

The Edinburgh and Colossus, recently commissioned, have tested and tried the working of the new hydraulic machinery upon which are mounted the breech-loading guns of large calibre, and the results have been satisfactory. A report of target practice from the Colossus has been received, in which it is stated that four successive rounds from one of the 43-ton guns were fired in six minutes (the ship steaming at high speed and at a distance of 1500 yards from the target), and three hits were made.

The mountings for the still heavier guns of 67 and 110 tons necessarily involve many important and novel features. The tests with these mountings have, up to the present, been quite satisfactory, and it is hoped that the ships armed with these guns will soon carry out full experiments by which more experience will be gained.

Increase in size of quick-firing guns.

During the year important experiments have been undertaken with the view of extending the system of metallic cartridge in use for the quick-firing 6-pounder and smaller guns, to guns up to and including 6 inches in calibre. These trials demonstrated the practicability of producing efficient metallic cartridges of a size hitherto unattempted, and exhibited the many advantages which would accrue from working ammunition in this form.

In considering the results of the trials it became apparent that great benefit would result to the service if, in place of the 4-inch and 5-inch breech-loading guns, at the present time mounted somewhat

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indiscriminately in ships of different classes, a quick-firing gun could be substituted, of intermediate size, with metallic cartridges carrying their own means of ignition.

Approved quick-firing gun.

After several trials, a gun firing a projectile of 36 lbs. was selected as combining certain advantages which either a lighter or heavier gun would fail to secure. It is the largest gun that can, with a sufficient supply of ammunition, be carried by the torpedo gunboats (the smallest ships in the service), and the heaviest which can be worked with a shoulder-piece for training, a great object in the delivery of a rapid and accurate fire against the attack of torpedo boats.

Very greatly increased rapidity of fire has been obtained from this gun. With its special mounting and ammunition, ten rounds can be fired in a minute, as compared with two rounds a minute, the limit of rapidity with the present 4 and 5-inch B.L. guns. In future new ships it will supersede the 4-inch and 5-inch gun.

6-inch quick-firing gun.

A 6-inch quick-firing gun to fire a projectile of 100 lbs. is under construction, and will soon be ready for trial. Should this gun prove in all respects as satisfactory as the 36-pounder (which there is every reason for hoping), it will form a most valuable addition to naval armaments, without the disadvantage of introducing a gun of new calibre into the Naval Service.

Development of rapid-firing gun system.

The importance of the development of rapid-firing guns can only be fully appreciated when it is borne in mind that, in consequence of the great speed of future fighting ships, the practice from slow-firing guns must be most uncertain on account of the rapid alteration of distance. The system of mounting connected with these quick-firing guns allows the firer to keep his eye along the sights on the object while training or elevating the gun himself. The operation of loading is quite independent of the firer, and means have been found for the electric ignition of the charge, the primers being so fitted that the electric circuit cannot be completed till the breech of the gun is completely closed. The firer can, therefore, press the trigger whenever the sights are aligned on the object, knowing that the gun cannot fire unless safe, and his whole attention is thus concentrated on the object he is firing at, with the additional advantage of being able to rectify any miscalculation of distance in the preceding discharge. Under such conditions rapid firing should conduce to accurate rather than to wild practice.

It is intended for the future that the 36-pr. and the 6-inch 100-pr. quick-firing guns, together with the 9·2 inch 22-ton gun in the large

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Types of quick-firing guns for the future.

unarmoured vessels, should be the main armament of Her Majesty's Navy for vessels other than armourclads, supplemented in all cases by the light 3-pr. quick-firing gun.

During the past year 131 torpedoes have been manufactured and issued ready for service, and a further number of 126 will have been issued by the end of the present financial year 1887–88.

It may be interesting to note the rapid growth of expenditure connected with Naval Ordnance, which the following table illustrates:—

Amount taken each year from 1881–82 *in Army and Navy Estimates respectively for Naval Ordnance.*

Year.	Army Votes.	Navy Votes.	Total.
	£	£	£
1881–82	369,000	49,329	418,329
1882–83	616,033	63,990	680,023
1883–84	500,491	161,905	662,396
1884–85	500,000	185,580	685,580
1885–86	850,000	308,900	1,158,900
1886–87	1,000,000	599,900	1,599,900
1887–88	1,707,561	593,700	2,301,261
1888–89	..	2,177,638	2,177,638

ORGANIZATION OF THE FLEET.

Intelligence Department.

In considering and settling the many subsidiary questions which arise in connection with the conversion of a peace establishment into one ready for war, the Intelligence Department has been most useful. The head of the department has shown a remarkable aptitude for his work, and he has been well supported by the officers under him. The amount and nature of the information collated and distributed must necessarily be kept secret, but the work of the branch connected with the mobilisation of the Fleet, and the utilization of naval reserves and resources, may roughly be sketched.

The main principle underlying the scheme has been first to make each of the three great commands, Portsmouth, Devonport, and Sheerness, as far as possible self-supporting, by dividing the whole country into three districts, and sending all men from the same district to the

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same port. Secondly, to arrange that the various officers connected with the manning should man the ships under the superintendence of their respective Commanders-in-Chief, and to place these officers in direct communication with those in charge of the reserves.

The men having been called out in the manner provided by law, each Commander-in-Chief becomes responsible for obtaining the men he requires for the ships in his port without reference to the Admiralty.

The complements for each ship have been drawn up, and a new classification of the ranks and ratings made, which return will be issued quarterly.

These new arrangements have been tried experimentally at Portsmouth, and the Commander-in-Chief, in reporting the result, said:—

Report of trial.

"The officers of the various depot ships have taken a great interest in carrying out the details of the scheme, and with a very satisfactory result. A signal was made at 1 p.m. on the 27th ultimo, and before 4 o'clock complete returns were rendered from each depot ship of the appropriation of petty officers and men for all ships in and preparing for the First Class Steam Reserve, the torpedo boats, and armed merchant steamers. It will be observed that the crews are in each case practically complete, and there can be no doubt that a great advance has been made towards the speedy manning of the Fleet in case of sudden necessity."

"It must be remembered that in this instance the officers of the depot ships have taken a strong personal interest in the scheme, being aware that it is novel and on its trial."

"So long as the executive officers will personally give the time and trouble necessary to work out the details, there will not be any difficulty with the present forms in manning all available ships in the course of forty-eight hours."

Retired officers consulted.

With the object of placing our reserves of officers on a satisfactory footing, the lists of retired officers have been carefully examined, and all eligible for employment have been asked if they would be ready to serve in an emergency. Steps have also been taken towards instituting a gunnery and torpedo course for retired officers, and for placing them, when called out for service, on the same footing as officers on the active list.

Armed Mercantile Cruisers.

Special provision has been made in this year's Estimates for the armament and clothing connected with the manning of these vessels, and arrangements are nearly complete for their rapid commissioning.

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Coaling and Supplies of Coal.

Coal supply.

Considerable advance has been made in this all-important matter. The supplies of coal required at home and foreign stations, and the best means of obtaining them, have been carefully considered.

New coaling arrangements.

A number of lighters have been ordered for facilitating the coaling of our ships afloat, both on the home and foreign stations. Arrangements have been made for taking up cruiser colliers, and coaling outfits to be used by colliers in company with a fleet will be stored at various places at home and abroad. We hope during the year to be able to make some progress with works at Portland for unloading sea-borne and railway-carried coal, but until the plans have been more carefully investigated and accurate estimates produced, I did not consider it advisable to sanction any premature expenditure.

CONCLUSION.

The experience gained since last year, and the opportunities afforded during that time of making close and minute comparison between the strength of the Navy of this country and that of foreign nations confirms my previous statement, that our relative superiority is undoubted, and that we shall, if the present expenditure be maintained, each year increase that superiority. Our organisation for war has much improved during the last year, and satisfactory progress has been made in working out and fitting together the complementary parts of a scheme for the full utilization in time of emergency of the naval resources of the country. Looking, however, at the three main component parts of a fleet, ships, guns, and men, we have no reason to be dissatisfied with what we have got, if we take not an ideal standard, but that common to the fleets of our neighbours. The ships recently completed and commissioned have fulfilled, on the whole, the undertaking of their designers, and, although one or two casualties have occurred in the past in the manufacture of our larger guns, out of the great number issued during the last eighteen months for service, none have in any sense failed.

Arming of the coaling stations.

The determination of the Government to effectively arm the coaling stations abroad and the home ports must largely increase our offensive naval power, for the bases of operation from which our fleet can issue will require little or no naval defence.

But, if it is permissible to speak with confidence of our superiority

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so far as actual fighting power is concerned, when we consider the defence and protection which our commerce may require, extreme caution and reserve must be exercised. The conditions of naval warfare have so changed, and are so changing from day to day, that nothing but actual experience could justify any confident prediction as to how a thoroughly effective protection can be given by any fleet to a commerce whose seagoing steam tonnage is double that of the rest of the world.

In the revision and preparation of our present Estimates we have made provision for all immediate requirements, and we have not hesitated in every direction to cut off extraneous and questionable expenditure. But new wants may more than counterbalance future economies, and it would therefore not be safe, in our judgment, to attempt hereafter to place at a lower total than the aggregate sums to be spent this year upon naval objects, the future annual expenditure of the Navy.

GEORGE HAMILTON.

28*th February*, 1888.

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VII.—Abstract of Navy

Votes.		Estimates, Gross Estimate.	Estimates, Appropriations in Aid.
	I. Numbers.		
A.	Total Number of Officers, Seamen, Boys, Coastguard, and Royal Marines	....	....
	II.—Effective Services.	£	£
1	Wages, &c., of Officers, Seamen and Boys, Coastguard, and Royal Marines	3,214,607	101,907
2	Victualling and Clothing for the Navy . . .	1,237,800	281,400
3	Medical Establishments and Services . . .	139,130	19,630
4	Martial Law	11,520	20
5	Educational Services	92,522	19,022
6	Divine Service	33,600	500
7	Royal Naval Reserves	143,860	60
8	Shipbuilding, Repairs, Maintenance, &c.:		
..	Section I.—Personnel	1,637,556	31,356
..	Section II.—Materiel	1,135,125	211,625
..	Section III.—Contract Work	1,514,200	....
9	Naval Armaments	1,863,500	....
10	Works, Buildings, and Repairs at Home and Abroad	382,300	6,000
11	Miscellaneous Effective Services	119,950	2,950
12	Scientific Services	65,460	9,860
13	Admiralty Office	220,920	8,820
	Total Effective Services . . £	11,812,050	693,150
	III.—Non-Effective Services.		
14	Reserved and Retired Pay	721,091	91
15	Naval Pensions	743,648	48
16	Widows' Pensions and Compassionate Allowances .	168,500	....
17	Civil Pensions and Gratuities	331,283	483
	Total Non-Effective Services . . £	1,964,522	622
..	Freight, &c., for the Army (Conveyance of Troops) .	....	....
	Grand Total . . . £	13,776,572	693,772

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Estimates for 1888–89.

1888–89.	Estimates, 1887–88, Adjusted to compare with re-arranged Votes for 1888–89.			Difference on Net Estimates.		Votes.
Net Estimate.	Gross Estimate.	Appropriations in Aid.	Net Estimate.	Increase.	Decrease.	
Total Numbers.			Total Numbers.	Numbers.	Numbers.	
62,400	...	...	62,500	...	100	A.
£	£	£	£	£	£	
3,112,700	3,176,751	126,892	3,049,859	62,841	...	1
956,400	1,345,969	285,950	1,060,019	...	103,619	2
119,500	142,058	19,330	122,728	...	3,228	3
11,500	11,250	...	11,250	250	...	4
73,500	96,510	19,441	77,069	...	3,569	5
33,100	33,668	600	33,068	32	...	6
143,800	149,140	40	149,100	...	5,300	7
						8
1,606,200	1,824,325	31,465	1,792,860	...	186,660	Sec. I.
923,500	1,456,560	191,275	1,265,285	...	341,785	Sec. II.
1,514,200	1,777,085	...	1,777,085	...	262,885	Sec. III.
1,863,500	115,000	...	115,000	1,748,500	...	9
376,300	474,392	6,000	468,392	...	92,092	10
117,000	122,930	5,268	117,662	...	662	11
55,600	64,907	7,827	57,080	...	1,480	12
212,100	223,869	8,820	215,049	...	2,949	13
11,118,900	11,014,414	702,908	10,311,506	1,811,623	1,004,229	
721,000	723,714	...	723,714	...	2,714	14
743,600	736,559	44	736,515	7,085	...	15
168,500	168,351	...	168,351	149	...	16
330,800	331,271	537	330,734	66	...	17
1,963,900	1,959,895	581	1,959,314	7,300	2,714	
...	245,540	3,960	205,980	...	205,980	
13,082,800	13,219,849	743,049	12,476,800	1,818,923	1,212,923	
Abate,—Amounts included above:			£	£	£	
(*a*) Transferred from Army Votes for Naval Armaments			1,717,561			
Less,— (*b*) Transferred to Army Votes for Army Transport Service			205,980			
				1,511,581	...	
				307,342	1,212,923	
Net Decrease on Navy Votes						£905,581

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STATEMENT showing the Actual and Estimated EXPENDITURE for NAVAL SERVICES for the Three Years ending the 31st March, 1889.

		£	s.	d.
1886-87 .	Estimated Expenditure (after deducting Appropriations in Aid)	12,993,100	0	0
	Supplementary Estimate (23rd February, 1887) .	277,000	0	0
		13,270,100	0	0
	Net Expenditure, as per Final Account . .	13,118,657	4	1
	Net Surplus (Expenditure less than Estimate)	£151,442	15	11
1887-88 .	Estimated Expenditure (after deducting Appropriations in Aid)	£12,476,800	0	0
1888-89 .	Estimated Expenditure (after deducting Appropriations in Aid)	£13,082,800	0	0

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STATEMENT of the Principal Points of DIFFERENCE between the ESTIMATES of 1887–88 and those for 1888–89.

INCREASES.		£
Wages, &c. of Officers, &c.		39,400
Decrease in Contribution for Ships in Indian Waters		31,500
Net Decrease in anticipation of Sales of Ships and Stores		5,000
Machinery for Her Majesty's Ships (Contract)		177,000
Royal Reserve of Merchant Cruisers		9,000
Armaments		1,748,500
Non-Effective Services		4,600
DECREASES.	£	
Victualling and Clothing	111,700	
Royal Naval Reserves	5,300	
Wages of Artificers, &c., in Her Majesty's Dockyards	180,000	
Armour and Armour Bolts	267,000	
Other Naval Stores	88,000	
Ships Building by Contract	235,000	
Gun Mountings and Torpedo Carriages (Contract)	195,000	
Machinery for Shore Establishments (Contract)	15,000	
Works, Buildings, &c.	92,000	
Transport Vote	205,980	
Miscellaneous Services	14,020	
	1,409,000	2,015,000
Abate,—		
Amounts included above :		
(*a*) Transferred from Army Votes for Naval Armaments	....	1,717,561
(*b*) Transferred to Army Votes for Army Transport Service	205,980	....
	£ 1,203,020	297,439
Net Decrease on Navy Votes		£905,581

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STATEMENT showing the NET ORDINARY and SPECIAL NAVAL EXPENDITURE from for 1888–89, re-arranged for

	Vote.	EXPENDITURE.					
		1874–75.	1875–76.	1876–77.	1877–78.	1878–79.	1879–80.
	—	Numbers, 60,000.	Numbers, 60,000.	Numbers, 60,000.	Numbers, 60,000.	Numbers, 60,000.	Numbers, 58,800.
		£	£	£	£	£	£
EFFECTIVE SERVICES.							
Wages, &c., of Seamen and Marines. . . .	1	2,514,232	2,552,019	2,626,038	2,618,697	2,688,140	2,664,557
Victuals and Clothing of Seamen and Marines .	2	1,086,881	1,110,339	1,074,769	1,079,563	1,004,762	935,656
Admiralty Office . .	3	182,779	186,768	189,693	193,734	197,201	183,749
Coast Guard Service, and Royal Naval Reserves, &c.	4	168,270	185,594	196,689	193,285	186,984	190,551
Scientific Branch . .	5	120,014	101,087	97,002	94,031	92,732	93,427
Dockyards and Naval Yards at Home and Abroad .	6	1,253,390	1,356,173	1,338,950	1,348,871	1,464,490	1,357,664
Victualling Yards, at Home and Abroad . . .	7	72,412	73,001	75,204	75,259	75,499	73,060
Medical Establishments, at Home and Abroad . .	8	64,667	65,190	65,307	65,522	66,887	65,862
Marine Divisions . .	9	18,437	18,127	20,314	20,410	20,760	20,532
Naval Stores . . .	10 I	1,274,444	1,009,320	1,140,990	1,117,097	1,268,015	903,824
Machinery and Ships built by Contract . . .	10 II	823,657	913,675	1,355,390	1,041,341	1,008,143	783,529
Naval Armaments (1888–89)	New	..	..	..	..	..	..
New Works, Buildings, Yard Machinery, and Repairs .	11	614,713	624,939	505,023	495,508	529,721	537,841
Medicines and Medical Stores	12	72,385	74,141	76,999	75,533	76,068	65,314
Martial Law, &c. . .	13	15,361	15,815	14,741	8,124	7,709	7,816
Miscellaneous Services .	14	117,969	174,249	149,175	137,718	131,706	125,383
Total .		8,399,611	8,460,437	8,926,284	8,564,693	8,818,817	8,008,765
NON-EFFECTIVE SERVICES.							
Half-Pay, Reserved Half-Pay, and Retired Pay to Officers of the Navy and Marines . . .	15	876,558	881,014	868,524	870,591	877,783	891,524
Military Pensions and Allowances	16 I	680,016	703,855	734,204	761,546	781,505	810,883
Civil Pensions and Allowances	16 II	287,779	282,407	282,778	276,578	277,074	299,970
Total .		1,844,353	1,867,276	1,885,506	1,908,715	1,936,362	2,002,377

N B.—For the purposes of comparison, the Exchequer Extra Receipts from 1874–75 to 1882–83 have been deducted from the Expenditure shown on the Appropriation Accounts.

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the Year 1874–75 to 1886–87, and the ESTIMATES for the Year 1887–88 and comparison with prior Years.

EXPENDITURE.							ESTIMATE.	
1880–81.	1881–82.	1882–83.	1883–84.	1884–85.	1885–86.	1886–87.	1887–88.	1888–89. Re-arranged for comparison with prior Years.
Numbers, 58,800.	Numbers, 58,100.	Numbers, 57,500.	Numbers, 57,250.	Numbers, 56,950.	Numbers, 58,000. *1000. †2500.	Numbers, 61,400.	Numbers, 62,500.	Numbers, 62,400.
£	£	£	£	£	£	£	£	£
2,584,887	2,676,832	2,556,713	2,580,134	2,696,750	2,773,634	2,867,958	2,940,700	3,001,388
918,218	988,929	1,026,661	926,562	892,769	939,894	948,211	992,000	887,880
174,406	178,000	178,800	180,301	187,549	200,216	207,070	211,300	206,007
193,332	187,989	192,292	188,173	191,658	192,554	187,511	204,900	198,824
90,946	107,116	101,949	106,604	105,969	109,538	108,781	108,800	104,811
1,369,310	1,463,287	1,530,111	1,602,993	1,614,745	1,670,432	1,720,178	1,732,600	1,522,141
69,052	70,626	68,993	69,034	70,147	71,248	70,999	71,800	68,480
62,522	64,963	65,658	67,736	67,534	68,380	67,696	65,900	65,865
20,299	20,638	20,766	21,872	19,932	20,797	21,598	21,700	21,854
995,935	1,105,999	1,042,047	1,101,559	1,214,456	1,344,250	1,295,347	1,207,000	856,829
668,110	633,075	659,543	894,535	991,880	2,127,756	2,488,379	1,911,000	1,606,491
..	..	..	..	..	..	..	..	1,806,040
529,886	524,118	428,857	451,970	468,306	637,373	592,605	553,300	498,854
65,517	61,281	65,698	56,648	64,474	67,649	61,817	56,100	55,100
10,479	10,489	10,727	9,435	8,033	8,954	9,009	11,500	12,000
113,934	94,844	120,950	140,409	129,100	145,064	133,986	186,100	127,430
7,866,833	8,188,186	8,069,705	8,397,965	8,723,302	10,377,739	10,781,145	10,274,700	11,039,994
897,515	892,852	868,598	864,230	845,117	817,191	809,140	801,400	799,906
832,796	852,530	865,397	882,405	887,377	892,920	895,772	906,800	914,125
326,514	332,541	329,970	330,570	328,884	330,661	328,009	328,800	328,775
2,056,825	2,077,923	2,063,965	2,077,205	2,061,378	2,040,772	2,032,921	2,037,000	2,042,806

In 1883–84 provision for Naval Gun Mountings was transferred from Army to Navy Votes. (Vote 10, Sec. II.)

In 1885–86 the charge for Torpedo Carriages was transferred from Army to Navy Votes. (Vote 10, Sec. II.) In the same year an extended Programme of Shipbuilding was commenced by the Earl of Northbrook.

* Voted for Service in Egypt. † Supplementary Estimate, 18th February, 1886.

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STATEMENT showing the NET ORDINARY and SPECIAL NAVAL EXPENDITURE from for 1888–89, re-arranged for

	Vote.	EXPENDITURE.					
		1874–75.	1875–76.	1876–77.	1877–78.	1878–79.	1879–80.
	—	Numbers, 60,000.	Numbers, 60,000.	Numbers, 60,000.	Numbers, 60,000.	Numbers, 60,000.	Numbers, 58,800.
EXTRA ESTIMATE FOR SERVICES NOT NAVAL.		£	£	£	£	£	£
Freight, &c., for the Army (Conveyance of Troops)	17	181,073	173,114	212,450	242,541	837,242	182,321
Balances Irrecoverable	..	280	2,680	837	3,631	1,453	1,615
Total Net Ordinary Expenditure or Estimate.	..	10,425,317	10,503,507	11,025,077	10,719,580	11,593,874	10,195,078
SPECIAL EXPENDITURE ON ACCOUNT OF:—							
Ashantee Expedition	..	97,905	3,219	3,456	..	..	..
Additional Naval and Military Expenditure	..	..	..	..	1,904,384	..	..
South Africa	..	..	..	..	..	171,602	617,895
Transvaal	..	..	..	..	..	..	..
Egypt	..	..	..	..	..	..	..
Bechuanaland	..	..	..	..	..	..	..
Special Preparations	..	..	..	..	..	..	..
Total Net Ordinary and Special Expenditure or Estimate ‡		10,523,222	10,506,726	11,028,533	12,623,964	11,765,476	10,812,973
Appropriations in Aid	..	215,043	220,015	230,506	229,921	246,269	209,639
Exchequer Extra Receipts	..	253,056	397,198	231,302	176,080	193,663	191,421
Total Net Ordinary and Special Expenditure or Estimate, as above ‡		10,523,222	10,506,726	11,028,533	12,623,964	11,765,476	10,812,973
GROSS EXPENDITURE OR ESTIMATE		10,991,321	11,123,939	11,490,341	13,029,965	12,205,408	11,214,033
Deduct, — Appropriations in Aid		215,043	220,015	230,506	229,921	246,269	209,639
NET AMOUNT VOTED BY PARLIAMENT		10,776,278	10,903,924	11,259,835	12,800,044	11,959,139	11,004,394

N.B.—For the purposes of comparison, the Exchequer Extra Receipts from 1874–75 to 1882–83 have been deducted from the Expenditure shown on the Appropriation Accounts.

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the Year 1874–75 to 1886–87, and the ESTIMATES for the Year 1887–88 and comparison with prior Years—*continued.*

EXPENDITURE.							ESTIMATE.	
1880–81.	**1881–82.**	**1882–83.**	**1883–84.**	**1884–85.**	**1885–86.**	**1886–87.**	**1887–88.**	**1888–89.** Re-arranged for comparison with prior Years.
Numbers, 53,800.	Numbers, 58,100.	Numbers, 57,500.	Numbers, 57,250.	Numbers, 56,950.	Numbers, 58,000. *1,000. †2,500.	Numbers, 61,400.	Numbers, 62,500.	Numbers, 62,400.
£	£	£	£	£	£	£	£	£
223,233	123,767	131,008	135,113	152,356	263,597	129,987	165,100	..
4,975	1,887	1,868	1,015	1,058	1,168	433	..	..
10,151,866	10,391,763	10,266,546	10,611,298	10,938,094	12,683,276	12,944,486	12,476,800	13,082,800
..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..
172,982	..	..	..	..	..	..	..	..
..	297,518	..	..	..	..	..	..	..
..	..	1,646,612	147,297	635,719	1,171,789	174,171	..	..
..	..	..	..	51,996	6,330	..	..	..
..	..	..	..	..	2,332,305	..	..	..
10,324,848	10,689,281	11,913,158	10,758,595	11,625,809	16,193,700	13,118,657	12,476,800	13,082,800
436,603	495,428	827,224	874,839	697,783	862,986	652,225	685,449	693,772
188,621	181,642	150,051 (Arrears.)	..	..	..	..	..	..
10,324,848	10,689,281	11,913,158	10,758,595	11,625,809	16,193,700	13,118,657	12,476,800	13,082,800
10,950,072	11,366,351	12,890,433	11,633,434	12,323,592	17,056,686	13,770,882	13,162,249	13,776,572
436,603	495,428	827,224	874,839	697,783	862,986	652,225	685,449	693,772
10,513,469	10,870,923	12,063,209	10,758,595	11,625,809	16,193,700	13,118,657	12,476,800	13,082,800

In 1883–84 provision for Naval Gun Mountings was transferred from Army to Navy Votes. (Vote 10, Sec. II.)

In 1885–86 the charge for Torpedo Carriages was transferred from Army to Navy Notes. (Vote 10, Sec. II.) In the same year an extended Programme of Shipbuilding was commenced by the Earl of Northbrook.

* Voted for Service in Egypt. † Supplementary Estimate, 18th February, 1886.

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STATEMENT showing the Total Estimated EXPENDITURE for the NAVAL SERVICE, including Amounts provided in the NAVY ESTIMATES, as well as in the CIVIL SERVICE and other ESTIMATES, for the following Services:—

		1888–89.	1887–88.
NAVY ESTIMATES:		£	£
Estimated Expenditure (after deducting Appropriations in Aid)		13,082,800	12,476,800
Guns, Ammunition, &c. (Value of Supplies by the War Department)		Provided in Navy Estimates	1,707,561
CIVIL SERVICE ESTIMATES:			
Estimated Expenditure under—			
Class I. Vote 6.—Public Buildings, Great Britain:			
New Works and Alterations, &c.	2,000		
Rents, Insurance, Tithes, &c.	5,330		
Maintenance, Fuel, Gas, &c.	2,920		
		10,250	10,710
Class I. Vote 8.—Furniture of Public Offices, Great Britain		1,400	2,300
„ I. „ 13.—Surveys of the United Kingdom		100	100
„ I. „ 21.—Rates on Government Property.		51,000	52,500
„ I. „ 25.—Public Buildings, Ireland:			
Purchase of Sites	..		
New Works and Alterations, viz.:			
Coast Guard	6,350		
Naval Reserve	3,730		
Maintenance and Supplies	5,691		
Furniture, Fittings, &c.	259		
	16,030		
Less,—Receipts	..		
		16,030	14,020
Class II. Vote 12.—Exchequer and Audit Department (Cost of Audit)		10,286	10,286
„ II. „ 24.—Stationery and Printing		44,345	49,500
„ III. „ 1.—Law Charges, England (Net)		2,801	2,606
„ III. „ 12.—Prisons, England:			
Convict Labour	50,468		
Maintenance of Naval Prisoners	1,034		
		51,502	52,602
„ III. „ 26.—Prisons, Scotland		100	100
„ III. „ 31.—Prisons, Ireland		116	116
REVENUE DEPARTMENTS:			
Post Office.—Postage of Official Correspondence		14,560	16,295
GREENWICH HOSPITAL FUNDS		2,941	2,789
Total		13,288,231	14,398,285

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ESTIMATED EXPENDITURE DURING 1888–89.

DESCRIPTION OF WORK.	DOCKYARD WORK. Vote 8, Section I. Personnel. Dockyards at Home. Sub-Head B.	DOCKYARD WORK. Vote 8, Section I. Personnel. Dockyards Abroad. Sub-Head F.	DOCKYARD WORK. Vote 8, Section II. Materials Issued.	CONTRACT WORK, &c. Vote 8, Section III. Sub-Head A. Propelling and other Machinery.	Sub-Head B. Hulls, &c., Building by Contract.	Sub-Head C. Purchase of Ships and Vessels.	Sub-Head D. Repairs, &c., by Contract.	Sub-Head E. Inspection of Contract Work.	Sub-Head F. Gun Mountings and Torpedo Gear.	TOTAL. Vote 8. Section III.	GRAND TOTAL. Vote 8. Sections I. and III. and Materials issued for Ships Building and Refitting, &c.
	£	£	£	£	£	£	£	£	£	£	£
New Construction . { By Dockyard .	679,590	14,176	601,963	464,565	..	..	..	14,120	139,709	604,274	1,900,003
New Construction . { By Contract .	59,600	..	73,573	226,153	355,979	..	..		37,661	633,913	767,086
TOTAL New Construction (excluding Indirect Charges) .	**739,190**	**14,176**	**675,536**	**690,718** *23,631	**355,979** *9,550	..	..	**14,120**	**177,370**	**1,238,187** *33,181	**2,667,089** ***33,181**
Ships Refitting for Reliefs, and Ships Preparing for Re-commission, (excluding Indirect Charges) . . .	61,370	22,527	61,362	66,095	..	..	..	550	19,818	86,463	231,722
Repairs to Ships in Commission and in Reserve, &c. (excluding Indirect Charges)	151,850	38,799	113,058	†8,690	..	..	25,000	..	..	33,690	317,397
Total Miscellaneous Dockyard Services	310,904	62,473	112,613	..	..	..	..	330	..	330	486,320
Sub-Head G.—Yard Machinery for Her Majesty's Shore Establishments at Home and Abroad	..	..	..	..	..	..	..	..	..	44,185	44,185
Sub-Head H.—Royal Reserve of Merchant Cruisers	..	..	..	..	..	..	..	..	..	22,350	22,350
Sundry Services	..	..	..	..	..	..	..	..	55,784	55,784	55,784
Abate,—Labour to be expended on the manufacture of Torpedo Tubes, &c., which is included in the Value of the Finished Material Issued . .	..	..	*46,100*	..	..	..	..	..	..	..	*46,100*
TOTAL Estimated Expenditure during 1888–89	**1,243,314**	**137,975**	**916,469**	**789,134**	**365,529**	..	**25,000**	**15,000**	**252,972**	**1,514,170**	**3,811,928**
Total Labour . .	**£1,381,289.**										

* Sundries and Auxiliary Machinery unappropriated to Ships.

† Exclusive of the amounts for Hydra and Cyclops which are included in the above amount for Ships re-fitting for reliefs, &c.

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SUMMARY of SHIPS BUILDING, COMPLETING, and to be Commenced in HER MAJESTY'S DOCKYARDS, and by CONTRACT during the YEAR 1888–89.

CLASS OF SHIP.	TOTAL IN DOCKYARDS.			BY CONTRACT.			TOTAL IN DOCKYARDS AND BY CONTRACT			
	To Complete.	To Advance.	To Commence.	To Complete.	To Advance.	To Commence.	To Complete.	To Advance.	To Commence.	GRAND TOTAL.
ARMOURED:										
Battle Ships, 1st Class	2	4	..	..	(2)*	..	2	4	..	6
Cruisers, 1st Class	5	..	..	..	..	..	5	..	..	5
	7	4	..	..	..	..	7	4	..	11
PROTECTED:										
Cruisers, 1st Class	..	..	1	..	..	1	..	2	2	
Cruisers, 2nd Class	5	1	..	..	..	..	5	1	..	6
Cruisers, 3rd Class	..	..	5	*(2)	..	1	..	..	6	6
Torpedo Depôt Ships	..	..	1	..	..	..	..	1	1	
	5	1	7	..	..	2	5	1	9	15
UNPROTECTED:										
Sloops	3	..	2	..	..	..	3	..	2	5
Torpedo Gun Boats, 1st Class	1	..	6	..	..	..	1	..	6	7
Gun Boats, 1st Class	6	3	4	..	..	2	6	3	6	15
Surveying Vessel	1	..	..	..	..	..	1	..	1	1
Brig (Sailing)	..	..	1	..	..	..	..	..	1	1
Torpedo Boats, 1st Class	..	..	..	..	..	6	..	..	6	6
Torpedo Boats, 2nd Class	..	..	..	..	..	10	..	..	10	10
	11	3	13	..	..	†18	11	3	†31	†45
GRAND TOTAL, Ships Building and Completing	23	8	20	..	..	†20	23	8	†40	†71

* These ships will be completed by Contractors according to specification, and delivered during 1888–89; they will be finally completed at the Dockyards, and are therefore included in the numbers to be completed at the different Dockyards.

† Exclusive of two steam and twenty ordinary Coaling Lighters.

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Ships Building or Completing in Her Majesty's Dockyards for which Money was taken in the Navy Estimates for 1888–89.

Ships' Name.	Class of Ship.	Total Estimated Cost, with Armament.	Displacement at Load Draught.	Indicated Horse-Power.	Speed.	Manufacturer of Engines.	Date.		Where Building.
							Laid Down.	For Completion.	
		£							
Sans Pareil .	Battle Ship, 1st Class Armoured.	814,221	10,470	12,000	16·75	Humphrys .	21 April 1885	...	Thames Iron Works, completed at Chatham.
Victoria . .	Ditto ditto.	817,841	10,470	12,000	16·75	Ditto.	21 April 1885	...	Elswick, completed at Chatham.
Trafalgar . .	Ditto ditto.	853,244	11,940	12,000	16·5	Ditto.	18 Jan. 1886	1889	Portsmouth.
Nile . . .	Ditto ditto.	854,220	11,940	12,000	16.5	Maudslay .	8 April 1886	1890	Pembroke.
Anson . .	Ditto ditto.	729,961	10,660	11,500	16·75	Humphrys .	24 April 1883	1888	Pembroke, completed at Portsmouth.
Camperdown .	Ditto ditto.	734,997	10,600	11,500	16·75	Maudslay .	18 Dec. 1882	1888	Portsmouth.
Benbow. . .	Ditto ditto.	812,462	10,600	11,500	16·75	Ditto.	1 Nov. 1882	1888	Thames Iron Works, completed at Chatham.
Howe . .	Ditto ditto.	703,790	10,300	11,500	16·75	Humphrys .	7 June 1882	1888	Pembroke, completing at Portsmouth.
Rodney . .	Ditto ditto.	719,042	10,300	11,500	16·75	Ditto.	6 Feb. 1882	1888	Chatham.
Collingwood .	Ditto ditto.	675,463	9,500	9,570	16·4	Ditto.	12 July 1880	1888	Pembroke, completed at Portsmouth.
Edinburgh . .	Ditto ditto.	681,249	9,420	7,500	15·4	Ditto.	29 March 1879	1887	Ditto.
Hero . . .	Battle Ship, 2nd Class Armoured.	410,638	6,200	6,000	15·5	Rennie . .	21 April 1884	1888–89	Chatham.
Australia . .	Cruiser, 1st Class Armoured	292,542	5,600	8,500	18·0	Napier . .	21 April 1885	1888	Glasgow, completed at Chatham.
Immortalité .	Ditto ditto.	287,495	5,600	8,500	18·0	Earle . .	18 Jan. 1886	1888–89	Hull, completed at Chatham.
Galatea . .	Ditto ditto.	290,619	5,600	8,500	18·0	Napier . .	21 April 1885	1888	Glasgow, completed at Portsmouth.
Aurora . .	Ditto ditto.	297,088	5,600	8,500	18·0	Thomson .	1 Feb. 1886	1889–90	Pembroke, completed at Devonport.

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SUMMARY of SHIPS BUILDING, COMPLETING, and to be Commenced in HER MAJESTY'S DOCKYARDS, and by CONTRACT during the YEAR 1888–89.

CLASS OF SHIP.	TOTAL IN DOCKYARDS.			BY CONTRACT.			TOTAL IN DOCKYARD AND BY CONTRACT.			
	To Complete.	To Advance.	To Commence.	To Complete.	To Advance.	To Commence.	To Complete.	To Advance.	To Commence.	GRAND TOTAL.
ARMOURED:										
Battle Ships, 1st Class	2	4	..	..	(2)*	..	2	4	..	6
Cruisers, 1st Class	5	..	..	..	..	..	5	..	..	5
	7	4	..	..	..	..	7	4	..	11
PROTECTED:										
Cruisers, 1st Class	..	..	1	..	..	1	..	..	2	2
Cruisers, 2nd Class	5	1	..	..	..	..	5	1	..	6
Cruisers, 3rd Class	..	..	5	*(2)	..	1	..	..	6	6
Torpedo Depôt Ships	..	..	1	..	..	..	..	..	1	1
	5	1	7	..	..	2	5	1	9	15
UNPROTECTED:										
Sloops	3	..	2	..	..	..	3	..	2	5
Torpedo Gun Boats, 1st Class	1	..	6	..	..	..	1	..	6	7
Gun Boats, 1st Class	6	3	4	..	..	2	6	3	6	15
Surveying Vessel	1	..	..	..	..	..	1	..	1	1
Brig (Sailing)	..	..	1	..	..	..	..	..	..	1
Torpedo Boats, 1st Class	..	..	..	..	..	6	..	..	6	6
Torpedo Boats, 2nd Class	..	..	..	..	..	10	..	..	10	10
	11	3	13	..	..	†18	11	3	†31	†45
GRAND TOTAL, Ships Building and Completing	**23**	**8**	**20**	**..**	**..**	**†20**	**23**	**8**	**†40**	**†71**

* These ships will be completed by Contractors according to specification, and delivered during 1888-89; they will be finally completed at the Dockyards, and are therefore included in the numbers to be completed at the different Dockyards.

† Exclusive of two steam and twenty ordinary Coaling Lighters.

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Ships Building or Completing in Her Majesty's Dockyards for which Money was taken in the Navy Estimates for 1888–89.

Ships' Name.	Class of Ship.	Total Estimated Cost, with Armament.	Displacement at Load Draught.	Indicated Horse-Power.	Speed.	Manufacturer of Engines.	Date.		Where Building.
							Laid Down.	For Completion.	
		£							
Sans Pareil .	Battle Ship, 1st Class Armoured.	814,221	10,470	12,000	16·75	Humphrys .	21 April 1885	....	Thames Iron Works, completed at Chatham.
Victoria . .	Ditto ditto.	817,841	10,470	12,000	16·75	Ditto.	21 April 1885	....	Elswick, completed at Chatham.
Trafalgar . .	Ditto ditto.	853,244	11,940	12,000	16·5	Ditto.	18 Jan. 1886	1889	Portsmouth.
Nile . . .	Ditto ditto.	854,220	11,940	12,000	16.5	Maudslay .	8 April 1886	1890	Pembroke.
Anson . .	Ditto ditto.	729,961	10,600	11,500	16·75	Humphrys .	24 April 1883	1888	Pembroke, completed at Portsmouth.
Camperdown .	Ditto ditto.	734,997	10,600	11,500	16·75	Maudslay .	18 Dec. 1882	1888	Portsmouth.
Benbow. . .	Ditto ditto.	812,462	10,600	11,500	16·75	Ditto.	1 Nov. 1882	1888	Thames Iron Works, completed at Chatham.
Howe . .	Ditto ditto.	703,790	10,300	11,500	16·75	Humphrys .	7 June 1882	1888	Pembroke, completing at Portsmouth.
Rodney . .	Ditto ditto.	719,042	10,300	11,500	16·75	Ditto.	6 Feb. 1882	1888	Chatham.
Collingwood .	Ditto ditto.	675,463	9,500	9,570	16·4	Ditto.	12 July 1880	1888	Pembroke, completed at Portsmouth.
Edinburgh . .	Ditto ditto.	681,249	9,420	7,500	15·4	Ditto.	29 March 1879	1887	Ditto.
Hero . . .	Battle Ship, 2nd Class Armoured.	410,638	6,200	6,000	15·5	Rennie . .	21 April 1884	1888–89	Chatham.
Australia . .	Cruiser, 1st Class Armoured	292,542	5,600	8,500	18·0	Napier . .	21 April 1885	1888	Glasgow, completed at Chatham.
Immortalité .	Ditto ditto.	287,495	5,600	8,500	18·0	Earle . .	18 Jan. 1886	1888–89	Hull, completed at Chatham.
Galatea . .	Ditto ditto.	290,619	5,600	8,500	18·0	Napier . .	21 April 1885	1888	Glasgow, completed at Portsmouth.
Aurora . .	Ditto ditto.	297,088	5,600	8,500	18·0	Thomson .	1 Feb. 1886	1889–90	Pembroke, completed at Devonport.

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SHIPS BUILDING or COMPLETING in HER MAJESTY'S DOCKYARDS for which MONEY was taken in the NAVY ESTIMATES for 1888–89—*continued.*

Ships' Name.	Class of Ship.	Total estimated Cost, with Armament.	Displacement at Load Draught.	Indicated Horse-Power.	Speed.	Manufacturer of Engines.	Date.		Where Building.
							Laid down.	For Completion.	
		£							
Narcissus . .	Cruiser, 1st Class Armoured	292,305	5,600	8,500	18·0	Earle . .	27 April 1885	1888	Hull, completed at Chatham.
Warspite . .	Ditto ditto.	558,672	8,400	10,000	16·75	Penn . .	25 Oct. 1881	Complete	Chatham.
Orlando . .	Ditto ditto.	295,221	5,600	8,500	18·0	Palmer . .	23 April 1885	1888	Jarrow, completed at Devonport.
Undaunted .	Ditto ditto.	293,440	5,600	8,500	18·0	Ditto.	23 April 1885	1888	Ditto ditto.
Severn . .	Cruiser, 2nd Class Protected	227,106	4,050	6,000	17·0	Humphrys .	1 Jan. 1884	Complete	Chatham.
Thames . .	Ditto ditto.	229,997	4,050	5,700	17·0	Penn . . .	17 April 1884	March 1888	Pembroke, completed at Devonport.
Forth . .	Ditto ditto.	221,084	4,050	5,700	17·0	Hawthorn .	1 Dec. 1884	1888-89	Ditto ditto.
Medea . .	Ditto ditto.	152,492	2,800	9,000	20·0	Humphrys .	25 April 1887	1889	Chatham.
Magicienne. .	Ditto ditto.	147,549	2,950	9,000	19·75	Hawthorn .	10 Aug. 1887	1889	Glasgow, completed at Portsmouth.
Medusa . .	Ditto. ditto.	152,516	2,800	9,000	20·0	Humphrys .	25 Aug. 1887	1889	Chatham.
Marathon . .	Ditto ditto.	147,549	2,950	9,000	19·75	Hawthorn .	10 Aug. 1887	1889	Glasgow, completed at Portsmouth.
Melpomene. .	Ditto ditto.	153,642	2,950	9,000	19·75	Palmer . .	10 Oct. 1887	1889-90	Portsmouth.
Blake . .	Cruiser, 1st Class Protected	..	9,000	20,000	22·0	..	..	..	Chatham.
Blenheim . .	Ditto ditto.	..	9,000	20,000	22·0	..	..	..	.. ..
Vulcan . .	Torpedo Depôt Ship Protected	..	6,620	12,000	20·0	..	..	..	Portsmouth.
Barrosa . .	Cruiser, 3rd Class Protected	..	1,580	3,000	16·5	..	..	1889-90	Ditto.

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Barracouta	Ditto ditto.	..	1,580	3,000	16·5	..	..	1889–90	Sheerness.
Bellona	Ditto ditto.	..	1,800	..	19·5	..	..	1889–90	.. ..
Blanche	Ditto ditto.	..	1,580	3,000	16·5	..	..	..	Pembroke.
Blonde	Ditto ditto.	..	1,580	3,000	16·5	..	..	..	Ditto.
Barham	Ditto ditto.	..	1,800	6,000	19·5	..	..	..	Portsmouth.
Archer	Cruiser, 3rd Class	96,087	1,770	3,500	17·0	Thomson	2 March 1885	1888	Glasgow, completed at Devonport.
Serpent	Ditto ditto.	103,422	1,770	4,500	17·0	Harland	9 Nov. 1885	1888	Devonport.
Brisk	Ditto ditto.	95,842	1,770	3,500	17·0	Thomson	2 March 1885	1888	Glasgow, completed at Devonport.
Racoon	Ditto ditto.	103,512	1,770	4,500	17·0	Harland	1 Feb. 1886	1888	Devonport.
Cossack	Ditto ditto.	94,215	1,770	3,500	17·0	Thomson	2 March 1885	1888	Glasgow, completed at Devonport.
Mohawk	Ditto ditto.	93,018	1,770	3,500	17·0	Ditto.	2 March 1885	1885	Glasgow, completed at Sheerness.
Porpoise	Ditto ditto.	95,928	1,770	3,500	17·0	Ditto.	2 March 1885	1888	Glasgow, completed at Portsmouth.
Tartar	Ditto ditto.	91,724	1,700	3,500	17·0	Ditto.	2 March 1885	1888	Glasgow, completed at Sheerness.
Fearless	Ditto ditto.	95,482	1,580	3,200	16·75	Barrow	22 Feb. 1884	1887	Barrow, completed at Portsmouth.
Buzzard	Sloop	69,116	1,140	2,000	14·5	Ditto.	7 May 1886	1887–88	Sheerness.
Daphne	Ditto.	63,082	1,140	2,000	14·5	Greenock Foundry Co.	20 June 1887	1888–89	Ditto.
Nymphe	Ditto.	63,125	1,140	2,000	14·5	Ditto.	5 July 1887	1888	Portsmouth.
Beagle	Ditto.	..	1,170	2,000	17·5	..	..	1889–90	Ditto.
Basilisk	Ditto.	..	1,170	2,000	17·5	..	..	1889–90	Sheerness.
Melita	Ditto.	65,619	970	1,200	12·5	Malta	18 July 1883	1888–89	Malta.

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SHIPS BUILDING or COMPLETING in HER MAJESTY'S DOCKYARDS for which MONEY was taken in the NAVY ESTIMATES for 1888–89—*continued.*

Ships' Name.	Class of Ship.	Total estimated Cost, with Armament.	Displacement at Load Draught.	Indicated Horse-Power.	Speed.	Manufacturer of Engines.	Date.		Where Building.
							Laid down.	For Completion.	
		£							
Narcissus . .	Cruiser, 1st Class Armoured	292,305	5,600	8,500	18·0	Earle . .	27 April 1885	1888	Hull, completed at Chatham.
Warspite . .	Ditto ditto.	558,672	8,400	10,000	16·75	Penn . .	25 Oct. 1881	Complete	Chatham.
Orlando . .	Ditto ditto.	295,221	5,600	8,500	18·0	Palmer . .	23 April 1885	1888	Jarrow, completed at Devonport.
Undaunted .	Ditto ditto.	293,440	5,600	8,500	18·0	Ditto.	23 April 1885	1888	Ditto ditto.
Severn . .	Cruiser, 2nd Class Protected	227,106	4,050	6,000	17·0	Humphrys .	1 Jan. 1884	Complete	Chatham.
Thames . .	Ditto ditto.	229,997	4,050	5,700	17·0	Penn . . .	17 April 1884	March 1888	Pembroke, completed at Devonport.
Forth . .	Ditto ditto.	221,084	4,050	5,700	17·0	Hawthorn .	1 Dec. 1884	1888-89	Ditto ditto.
Medea . .	Ditto ditto.	152,492	2,800	9,000	20·0	Humphrys .	25 April 1887	1889	Chatham.
Magicienne. .	Ditto ditto.	147,549	2,950	9,000	19·75	Hawthorn .	10 Aug. 1887	1889	Glasgow, completed at Portsmouth.
Medusa . .	Ditto. ditto.	152,516	2,800	9,000	20·0	Humphrys .	25 Aug. 1887	1889	Chatham.
Marathon . .	Ditto ditto.	147,549	2,950	9,000	19·75	Hawthorn .	10 Aug. 1887	1889	Glasgow, completed at Portsmouth.
Melpomene. .	Ditto ditto.	153,642	2,950	9,000	19·75	Palmer . .	10 Oct. 1887	1889-90	Portsmouth.
Blake . .	Cruiser, 1st Class Protected	..	9,000	20,000	22·0	..	..	..	Chatham.
Blenheim . .	Ditto ditto.	..	9,000	20,000	22·0	..	..	..	.. ..
Vulcan . .	Torpedo Depôt Ship Protected	..	6,620	12,000	20·0	..	..	..	Portsmouth.
Barrosa . .	Cruiser, 3rd Class Protected	..	1,580	3,000	16·5	..	..	1889-90	Ditto.

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Barracouta	Ditto ditto.	..	1,580	3,000	16·5	..	..	1889–90	Sheerness.
Bellona	Ditto ditto.	..	1,800	..	19·5	..	..	1889–90	.. ..
Blanche	Ditto ditto.	..	1,580	3,000	16·5	..	..	..	Pembroke.
Blonde	Ditto ditto.	..	1,580	3,000	16·5	..	..	..	Ditto.
Barham	Ditto ditto.	..	1,800	6,000	19·5	..	..	..	Portsmouth.
Archer	Cruiser, 3rd Class	96,087	1,770	3,500	17·0	Thomson	2 March 1885	1888	Glasgow, completed at Devonport.
Serpent	Ditto ditto.	103,422	1,770	4,500	17·0	Harland	9 Nov. 1885	1888	Devonport.
Brisk	Ditto ditto.	95,842	1,770	3,500	17·0	Thomson	2 March 1885	1888	Glasgow, completed at Devonport.
Racoon	Ditto ditto.	103,512	1,770	4,500	17·0	Harland	1 Feb. 1886	1888	Devonport.
Cossack	Ditto ditto.	94,215	1,770	3,500	17·0	Thomson	2 March 1885	1888	Glasgow, completed at Devonport.
Mohawk	Ditto ditto.	93,018	1,770	3,500	17·0	Ditto.	2 March 1885	1885	Glasgow, completed at Sheerness.
Porpoise	Ditto ditto.	95,928	1,770	3,500	17·0	Ditto.	2 March 1885	1888	Glasgow, completed at Portsmouth.
Tartar	Ditto ditto.	91,724	1,700	3,500	17·0	Ditto.	2 March 1885	1888	Glasgow, completed at Sheerness.
Fearless	Ditto ditto.	95,482	1,580	3,200	16·75	Barrow	22 Feb. 1884	1887	Barrow, completed at Portsmouth.
Buzzard	Sloop	69,116	1,140	2,000	14·5	Ditto.	7 May 1886	1887–88	Sheerness.
Daphne	Ditto.	63,082	1,140	2,000	14·5	Greenock Foundry Co.	20 June 1887	1888–89	Ditto.
Nymphe	Ditto.	63,125	1,140	2,000	14·5	Ditto.	5 July 1887	1888	Portsmouth.
Beagle	Ditto.	..	1,170	2,000	17·5	..	..	1889–90	Ditto.
Basilisk	Ditto.	..	1,170	2,000	17·5	..	..	1889–90	Sheerness.
Melita	Ditto.	65,619	970	1,200	12·5	Malta	18 July 1883	1888–89	Malta.

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SHIPS BUILDING or COMPLETING in HER MAJESTY'S DOCKYARDS for which MONEY was taken in the NAVY ESTIMATES for 1888–89—*continued.*

Ship's Name.	Class of Ship.	Total Estimated Cost, with Armament.	Displacement at Load Draught.	Indicated Horse-Power.	Speed.	Manufacturer of Engines.	Date.		Where Building.
							Laid Down.	For Completion.	
		£							
Pheasant . .	1st Class Gunboat . .	40,951	755	1,200	13·25	Devonport .	6 June 1887	1888–89	Devonport.
Partridge . .	Ditto ditto.	40,994	755	1,200	13·25	Ditto.	6 June 1887	1888–89	Ditto.
Peacock . .	Ditto ditto..	40,755	755	1,200	13·25	Barrow . .	9 May 1887	1888–89	Pembroke.
Plover . .	Ditto ditto.	40,712	755	1,200	13·25	Ditto.	16 May 1887	1888–89	Ditto.
Pigeon . .	Ditto ditto.	40,712	755	1,200	13·25	Ditto.	16 May 1887	1888–89	Ditto.
Pigmy . .	Ditto ditto.	40,712	755	1,200	13·25	Ditto.	8 Sept. 1887	1888–89	Sheerness.
Magpie . .	Ditto ditto.	41,839	805	1,200	13·0	Earle . .	5 Dec. 1887	..	Pembroke.
Redbreast . .	Ditto ditto.	41,839	805	1,200	13·0	Ditto.	2 Jan. 1888	..	Ditto.
Sparrow . .	Ditto ditto.	..	805	1,200	13·0	..	..	..	.. ..
Redpole . .	Ditto ditto.	41,839	805	1,200	13·0	Earle . .	12 Jan. 1888	..	Pembroke.
Thrush . .	Ditto ditto.	..	805	1,200	13·0	..	..	..	.. ..
Widgeon . .	Ditto ditto.	..	805	1,200	13·0	..	..	..	Pembroke.
Lapwing . .	Ditto ditto.	41,062	805	1,200	13·0	Devonport .	..	..	Devonport.
Ringdove . .	Ditto ditto.	41,062	805	1,200	13·0	Ditto.	..	..	Ditto.
Goldfinch . .	Ditto ditto.	..	805	1,200	13·0	..	..	..	Sheerness.
Rattlesnake .	Torpedo Gunboat . .	38,515	550	2,700	18·5	Laird . .	16 Nov. 1885	1887	Birkenhead, completed at Portsmouth.

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Grasshopper .	Ditto ditto.	39,312	525	3,000	19·0	Maudslay .	27 April 1886	1888	Sheerness.
Sharpshooter .	Ditto ditto.	51,821	735	4,500	21·0	Bellis . .	27 Sept. 1887	..	Devonport.
Sandfly . .	Ditto ditto.	40,097	525	3,000	19·0	Maudslay .	19 April 1886	1888	Ditto.
Spider . .	Ditto. ditto.	40,241	525	3,000	19·0	Ditto.	7 June 1886	1888	Ditto.
Spanker . .	Ditto ditto.	..	735	4,500	21·0	Bellis . .	..	..	Ditto.
Speedwell . .	Ditto ditto.	..	735	4,500	21·0	Laird . .	..	..	Ditto.
Salamander .	Ditto ditto.	..	735	4,500	21·0	Maudslay .	..	..	Chatham.
Seagull . .	Ditto ditto.	..	735	4,500	21·0	Ditto.	..	..	Ditto.
Sheldrake . .	Ditto ditto.	..	735	4,500	21·0	Ditto.	..	..	Ditto.
Skipjack . .	Ditto ditto.	..	735	4,500	21·0	Laird . .	..	..	Ditto.
Research . .	Surveying Vessel . .	26,023	520	450	10·5	Barrow . .	13 Sept. 1887	1888–89	Ditto.
Mayflower . .	Training Brig . . .	..	..	..	..	..	..	1889–90	Pembroke.
No. 61, Mooring Lighter.	Mooring Lighter . .	6,886	..	..	..	..	16 Oct. 1887	1888	Malta.

	Total estimated Cost, with Armament.
55 1st Class Torpedo Boats	822,204
6 Ditto ditto	53,050
10 2nd Class ditto	28,000
2 Steam Coaling Vessels	8,800
20 Coal Barges	26,000

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List of New Ships and Vessels Estimated to be passed into the First Reserve during the Years 1888–89 and 1887–88.

1888–89.					1887–88.				
Name of Ship.		Load Displacement in Tons.	Indicated Horse Power.	Number of Guns.	Name of Ship.		Load Displacement in Tons.	Indicated Horse Power.	Number of Guns.
ARMOURED SHIPS:					**ARMOURED SHIPS:**				
Anson	Battle-ships, First-class.	10,000	11,500	10	Benbow	Battle Ships, First-class.	10,600	11,500	12
Camperdown		10,000	11,500	10	Howe*		9,740	11,700	10
					Rodney		9,700	11,500	10
Australia	Cruisers, First-class.	5,600	8,500	12	Hero	Battle Ship, Second-class.	6,200	6,000	6
Galatea		5,600	8,500	12					
Narcissus		5,600	8,500	12	Warspite	Cruisers, First-class.	8,400	10,000	10
Immortalité		5,600	8,500	12	Orlando		5,600	8,500	12
Aurora		5,600	8,500	12	Undaunted*		5,600	8,500	12
PROTECTED SHIPS:					**PROTECTED SHIPS:**				
					Severn	Cruisers, Second Class.	4,050	6,000	12
					Thames		4,050	5,700	12
Forth	Cruisers, Second-class.	4,050	5,700	12					
Magicienne		2,950	9,000	6					
Marathon		2,950	9,000	6					
Medea		2,800	9,000	6					
Medusa		2,800	9,000	6					
					UNPROTECTED SHIPS:				
					Racoon*	Cruisers, Third-class.	1,770	4,500	6
					Serpent*		1,770	4,500	6
					Archer		1,770	3,500	6
					Brisk		1,770	3,500	6
					Cossack		1,770	3,500	6
					Mohawk		1,770	3,500	6
					Porpoise		1,770	3,500	6
					Tartar		1,770	3,500	6
					Fearless		1,580	3,200	4
UNPROTECTED SHIPS:					Buzzard	Sloop.	1,140	2,000	8
Daphne	Sloops.	1,140	2,000	8	Grasshopper*	Torpedo Gun-boats, First-class.	525	3,000	1
Melita		970	1,230	8	Sandfly*		525	3,000	1
Nymphe		1,140	2,000	8	Spider*		525	3,000	1
Partridge	Gun-boats, First-class.	755	1,200	6	Rattlesnake		550	2,700	1
Peacock		755	1,200	6					
Pigeon		755	1,200	6	Bramble	Gunboats, First-class.	780	1,000	6
Pigmy		755	1,200	6	Lizard		780	1,000	6
Pheasant		755	1,200	6					
Plover		755	1,200	6					
Sharpshooter	Torpedo Gun-boat, First-class.	735	4,500	1					
Research	Surveying Vessel.	520	450	1					

* *See* remarks with reference to completion against these ships on preceding pages.

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VIII.

Statement of the First Lord of the Admiralty, explanatory of Navy Estimates, 1889-90.

Introductory Remarks.

The full *vivâ voce* statement which I shall have to make in explanation of the whole scheme of shipbuilding for the future, with its attendant consequences, will anticipate much of what would otherwise have been dwelt upon in this memorandum, which is now rather of the nature of a summary than an exposition of the expenditure contained in the Navy Estimates 1889–90.

Excess over vote of 1888–89

The expenditure is estimated to be £602,600 in excess of that voted last year. The increases are mainly in the "Shipbuilding," "Manning," and "New Works" Votes; and the decrease in the Vote for Naval Ordnance. A short explanation of the causes of these variations is appended, as well as an account of the work done in 1888–89, and that proposed to be done in 1889–90.

SHIPBUILDING PROGRAMME.

Progress of New Construction (Contract, in 1888–89).

Anticipations of 1888–89 realized.

The anticipations expressed in my Statement of February 1888, as to the progress to be made in new construction during 1888–89, have been realised for the most part, and in some cases surpassed.

In a few instances the performance has fallen short of what was originally hoped for; but there have been special circumstances to account for the difference.

Victoria. Sans Pareil.

The completion for sea of the Victoria and Sans Pareil after their delivery by the contractors has been affected, as it was feared it might be, by the dates of delivery of the 110-ton turret guns. Both ships are, however, now fully in hand, and it is expected that the Victoria will be ready for commission (as flag-ship in the Mediterranean) in the course of two or three months.

Magicienne. Marathon.

The protected cruiser Magicienne has been delivered by the contractors, and is about to proceed on her steam trials. Her sister ship the Marathon, is nearly ready for delivery.

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Delay in Blenheim's contract.

The conclusion of a contract for the Blenheim was purposely delayed until September, 1888, for reasons that need not here be given; and this fact, together with the difficulty of obtaining an adequate supply of steel materials in consequence of the great demand for mercantile shipbuilding, accounts for the expenditure on that ship having fallen short of what was originally proposed.

Bellona, Australasian squadron.

Similar difficulties in obtaining material have been experienced by the contractors for the Bellona and the seven vessels for the Australasian service, but it is hoped that these difficulties have now been surmounted, and that in subsequent stages of the work lost ground will be recovered.

Sparrow, Thrush.

Two composite gunboats, the Sparrow and Thrush, complete the list of armed vessels building by contract. They are to be delivered early in the next financial year.

Small vessels.

Besides these armed vessels, there have been in progress in private yards a considerable number of coaling craft, designed in accordance with the recommendations of a special committee appointed to consider the arrangements suitable for coaling the fleet.

A new type of boat has also been designed for the purpose of being carried on board large warships, and employed in mining operations or in coaling. The first example of the type is now undergoing trial, and, if successful, it is proposed to add to the number in the coming financial year.

Torpedo boats.

Six first class and ten second class torpedo boats have been ordered during 1888–89 for naval service, and are considerably advanced.

The first class torpedo boats are 130 feet long, the guaranteed speed, when fully loaded, is 22½ knots, and they are to carry an armament of 3-pr. quick-firers as well as three torpedo tubes.

The second class boats are of an improved type, obtained as the result of competition between the firms most experienced in this class of work. They are 60 feet long, have a guaranteed speed of 16 knots, and are to carry a machine gun as well as two torpedo dischargers.

Torpedo boats for India.

In addition to these torpedo boats the Admiralty have advised and assisted the India Office in the construction of seven first class torpedo boats, which are now practically complete, and in course of being despatched to India.

Description of New Designs.

First class battle ships.

The *first class battle ships* to be laid down in 1889–90 include two types: one armed on the turret system, and the other on the barbette

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system. It is proposed to build one of the former and the remainder of the latter type.

They are to be superior in speed and auxiliary armament to all preceding battle ships of the Royal Navy; and will surpass them all in displacement.

Their principal dimensions are:—

Length	380 feet.
Breadth	75 „
Displacement (about) . .	14,150 tons.

Speed on measured mile:—

Forced draught (about) .	17½ knots.
Natural „ „ . .	16 „

Coal endurance:—

Speed of 10 knots (about) .	5000 knots.
„ 16 „ „ .	1800 to 2000 knots.

The armament of each ship will include:—

4 13½-in. 67-ton guns in two turrets or barbettes.
10 6-in. 5-ton guns, broadside.
18 to 24 6-pr. and 3-pr. quick-firers.
5 torpedo tubes (above water).
2 „ „ (submerged).

Armament arrangements.

The disposition of the armament has been most exhaustively considered. It has been decided as follows:—

To adopt an arrangement (in plan) similar to that carried out in the Trafalgar and Admiral classes.

To place each pair of heavy guns in a separate armoured enclosure, situated about 50 or 60 feet from the bow and stern.

To carry the 6-inch guns and smaller quick-firers chiefly in a long central battery, situated between the heavy gun stations.

Armour protection.

The armour protection of the hull proper includes two principal features:—

(1) A belt, 8½ feet broad, extending over two-thirds of the length of the vessel, and having a maximum thickness of 18-inch armour. Transverse armoured bulkheads complete the belt, a 3-inch steel deck is fitted above it, and a strong protective under-water deck completes the protection before and abaft the belt.

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(2) The broadside above the thick belt is protected, to a height of about 9½ feet above water over a considerable portion of the length, by 5-inch armour. Screen bulkheads, similarly armoured, enclose the central battery.

The protection of the heavy guns consists of 18-inch armour on the turrets and 17-inch on the redoubts protecting the turret-bases, &c. In the barbette ships the armour on the barbettes is 17-inch.

The protection of the guns and their crews in the auxiliary armament, as well as the ammunition supply, has been carefully arranged for, in view of the development of high explosives and quick-firing guns.

Freeboard.

The turret and barbette designs are identical in nearly all the above-mentioned features. The essential differences between them are—

(1) That the freeboard at the ends of the barbette ship is 18 feet as against 11¼ feet in the turret ship.
(2) That the height of the heavy guns above water is 23 feet in the barbette ship as against 17 feet in the turret ship.

Second class ironclads.

The *second class ironclads* will be reproductions on a smaller scale of the first class barbette ironclads, being in speed and coal endurance their equal, but carrying a somewhat lighter armament, and armour of less thickness. Their displacement will be about 9000 tons.

First class protected cruisers.

The *first class protected cruisers* which are to be commenced have been designed to carry an armament practically identical with that of the Blake and Blenheim (of which a full description was given last year); but they are to be of considerably less size and cost, to steam at a somewhat lower speed, and to have a smaller coal endurance than the Blake and Blenheim, although they will compare very favourably in these respects with any cruisers building for foreign navies.

Their dimensions are—

Length	360 feet.
Breadth	60 „
Displacement (about) . . .	7350 tons.
Speed on measured mile . . .	20 knots.
„ at sea (continuous steaming) .	18 „

Radius of action—

Speed of 10 knots (about) . .	10,000 „
„ 18 „ „ . . .	2800 „

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Armament:—

2 9·2-in. (22-ton) bow and stern chasers.
10 6-inch (5-ton) „ „ and broadside.
12 6-pr. quick-firers.
4 Torpedo tubes.

The protective deck, extending throughout the length, will have a maximum thickness of 5 inches of steel.

Careful consideration was given to the question of the best system of protecting these vessels, their guns and guns' crews, before the arrangements approved were finally decided. The use of a very strong protective deck over the vitals, in association with certain novel arrangements for protecting the guns and their crews from shell-fire, was preferred to alternative plans in which the broadsides, to a certain extent, were protected by comparatively thin vertical armour. Special care has also been bestowed upon the protection of the ammunition during its passage from the magazines to the guns, and unusual facilities have been provided for the transport of the ammunition.

Some to be copper-sheathed.

Some of the vessels of this type will be wood-sheathed and coppered, in order to adapt them for distant service on stations where docks will not be available, at least in war time. This will add somewhat to the displacements given above, and cause a small reduction of the measured mile speed.

Second class protected cruisers.

The *second class Cruisers*, of which it is proposed to construct a large number, may be described as enlarged Medeas. In protection, engine-power, speed, and coal-supply they are practically reproductions of the Medea class. They are more heavily armed than the Medea, 35 feet longer, and of about 600 tons greater displacement.

The principal dimensions, &c., are:—

Length	300 feet.
Breadth	43 „
Displacement (about) . . .	3400 tons.
Speed on measured mile . . .	20 knots.
„ at sea (continuous steaming) .	18 „

Radius of action:—

Speed of 10 knots (about) . . .	8000 „
„ 18 „ „ . . .	1000 „
„ 16 „ „ . . .	2000 „

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„ 18 „ „ . . .	2800 „

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Armament:—

2 9·2-in. (22-ton) bow and stern chasers.
10 6-inch (5-ton) „ „ and broadside.
12 6-pr. quick-firers.
4 Torpedo tubes.

The protective deck, extending throughout the length, will have a maximum thickness of 5 inches of steel.

Careful consideration was given to the question of the best system of protecting these vessels, their guns and guns' crews, before the arrangements approved were finally decided. The use of a very strong protective deck over the vitals, in association with certain novel arrangements for protecting the guns and their crews from shell-fire, was preferred to alternative plans in which the broadsides, to a certain extent, were protected by comparatively thin vertical armour. Special care has also been bestowed upon the protection of the ammunition during its passage from the magazines to the guns, and unusual facilities have been provided for the transport of the ammunition.

Some to be copper-sheathed.

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Speed on measured mile . . .	20 knots.
„ at sea (continuous steaming) .	18 „

Radius of action:—

Speed of 10 knots (about) . . .	8000 „
„ 18 „ „ . . .	1000 „
„ 16 „ „ . . .	2000 „

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Armament:—

2 6-inch (5-ton) bow and stern chasers.
6 4·7-inch quick-firers, broadside.
9 6-pounders and 3-pounders.
4 Torpedo tubes.

Protective deck: maximum thickness (on slopes) 2-inch steel, on horizontal portions, 1-inch.

A large proportion to be copper-sheathed.

It is proposed to wood-sheathe and copper the bottoms of a large proportion of these vessels, which will involve an increase of about 200 tons in the displacement given above, and a reduction of about one-quarter of a knot in the measured mile speed.

Pandora class.

Four *protected Cruisers* of the Pandora class are to be laid down in the Dockyards. They are to be built from the same design as the five Cruisers for Australasian service described in my Statement of last year.

Sharp-shooter class.

A description of the Sharpshooter class (*Torpedo Gunboats*) appeared in the same Statement. The first vessel of the class is now nearly complete, and about to enter upon her steam trials, so that it will shortly be possible to decide, as the result of experience, whether any changes are desirable in future vessels of the class.

Eleven vessels for the Royal Navy and two for India are now building from the Sharpshooter design; and it is proposed to lay down four more torpedo gunboats in the Dockyards in 1889–90.

DOCKYARD ADMINISTRATION.

Programme of 1888–89 not carried out.

It was anticipated, in framing the Estimates for 1888–89, that the twenty-three ships mentioned in the programme of last year would be completed and passed into the first class Reserve by the 31st March, 1889, and this would, without doubt, have been done, so far as the armoured ships are concerned, but for the delay in the delivery of their main armament.

The dockyard work is complete on all these vessels, except Camperdown, Anson, and Aurora, where there is but very little left to be done, and that little is dependent on the receipt of guns.

Trafalgar.

The Trafalgar might be completed by the end of June next, but her last gun will not be delivered until 31st August, 1889. If it had not been for this, and also for delays of materials for Trafalgar's turret roller paths, the cost of building would be less than is now expected. A reduction of £85,000 for labour, and £15,000 for material has, however, been made on her original building estimate.

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Nile.

The Nile, whose original estimate has been reduced by £80,000 for labour and £10,000 for material, has been advanced during the year to such an extent as to admit, if necessary, of her completion in 1889–90.

Substantial reductions have been made in the previous estimates for building Barrosa (£3000 for labour), Anson (£1800 for labour and £10,000 for material), Howe (£700 labour and £3300 material), and Beagle (£2000 labour and material).

Ships repaired or repairing for re-commission :—

Ships repairing.

Ship.	Service for which Repaired.	Cost of Repairs. (Dockyard.)	Amount less than that taken in the Estimates (Approximate).
		£	£
Penelope . . .	Cape of Good Hope . .	11,757	1,000
Tyne	Troop Service	6,105	4,800
Cleopatra . . .	Reliefs	31,500 (Approximate)	4,000
Champion . . .	Do.	30,500	4,400
Victory	Guardship	8,260	1,740

The work of re-engining Superb and Thunderer has been commenced, and will be completed next year. The building of a superstructure and carrying out repairs to Hydra and Cyclops will be completed this year. The repair of Triumph, Achilles, Minotaur, Nelson, and Audacious will be completed during the forthcoming financial year, and the reconstruction of the Rupert and Devastation will be well advanced.

Reduction in Estimates.

The Estimates as submitted by the Dockyard Officers for items of incidental charges were reduced by more than £30,000 ; but it appears, from the latest returns of actual expenditure, that a saving may be expected at the end of the year upon the approved estimates as reduced.

Still further reductions have been made in estimates of this class for 1889–90, and there is good reason to hope that in a short time the incidental expenditure will be brought down to a reasonable percentage upon the direct charges.

The number of men employed on board the various tugs and harbour craft has been considerably reduced without loss of efficiency. They swelled the incidental expenditure and had little to do, so that action in this direction was urgently needed.

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The Cost Account System has worked fairly well during the year, and has given us returns of expenditure which will be useful in checking the value of work done, and in providing reliable data for estimating purposes in the future.

An account of expenditure upon alterations and additions separate from that upon repairs is about to be commenced for Minotaur and Thunderer. After this has been started and tried in practice, it may be found possible to extend the system to all ships upon which alterations and additions are ordered to be carried out, and which are likely to cost over £200.

The cost of repairs, alterations, and additions to the vessels which took part in the Summer Manœuvres will be heavier than was anticipated when the Estimates for the current year were framed, but the excess is due to numerous alterations and additions proposed to be carried out in the various ships.

Ships proposed to be laid down in 1889-90.

It is proposed to commence building in the Dockyards during the present financial year the following twenty ships, viz. :—

4 Battle Ships, 1st class.
1 „ 2nd „
3 Protected Cruisers, 1st class.
2 „ „ 2nd „
4 Cruisers (Pandoras).
6 Torpedo Gunboats (Sharpshooter class).

To enable this new work to be begun, and to complete 26 out of the 30 ships now building, as well as push on the repairs and reconstructions above mentioned, the Vote for Shipbuilding, Repairs, Maintenance, &c. (Vote 8), has been increased by £615,900. The sum of £202,465 is the net increase on that part of this expenditure, as detailed in Vote B., appended to the Navy Estimates.

Speed trials.

A special order has been issued during the year, by which a higher rate of speed than that known as "economical speed" has been directed for the future to be periodically maintained by Her Majesty's Ships when making passages. The reasons for, and objects of, this order are explained in the Circular Letter in the Appendix.

NAVAL ORDNANCE.

The transfer to Naval Votes of the cost of Naval Ordnance has been associated during the past year with the difficulties which the assumption of new duties and responsibilities generally entails. In this instance they have been aggravated by the necessity of the

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Admiralty employing as their agents the very Department with whom they were not always in accord upon questions where the interests of the Army and Navy were not identical.

Considering the controversial nature of the points to be settled and the financial bearing upon the expenditure of the two departments by the division of the stores hitherto held in common, the work done has been remarkable. In future years, now that the ground has been cleared, there is little likelihood of a recurrence of this kind of questions, which has now been decided once for all.

The amount of the deficiencies of Ordnance Stores for Naval Service has now been ascertained, and although they are serious it is hoped they may be made up gradually in the course of the next three years, without in the meantime running any very great risk, as, by means of the increased plant recently put up by the private trade, ammunition for the smaller kinds of guns could be produced very quickly in the event of an emergency, whilst as regards projectiles of the heavier natures, which take a long time to make, arrangements have been made for ordering these in larger proportions at once.

As is well known, there has been very great delay in completing ships with guns. This delay was due to the faulty principle which was adopted in the design of these guns, viz., that of placing liners in the bores. These liners, when the guns were proved, cracked, and very considerable delay was caused before the guns were repaired and made efficient for issue to the Fleet. The difficulty, it is believed, has now been got over, and the War Office are of opinion that the block as regards ships of the Admiral class and the belted cruisers will be removed by June, that is, in sufficient time to admit of all the ships otherwise ready taking part in the Summer Manœuvres. It is believed that no further difficulties or delays need be anticipated in the future delivery of guns, as in the gun designs now approved the features which have led to the failures above referred to have been eliminated.

With reference to the new shipbuilding programme, the whole of the requirements for the large guns (that is those taking more than a year to manufacture) have been made known to the War Office, and from reliable information, which has been received and verified by personal inquiries, there seems to be no doubt, in view of the simpler form of gun designs now adopted, and of the larger experience and greatly increased plant of the private manufacturers, that the guns will be ready in ample time for the ships requiring them.

The 4·7-inch quick-firing gun has been brought into use since the date of my last Annual Statement, and all the anticipations have

The 4·7-inch quick-firing gun.

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4 Cruisers (Pandoras).
6 Torpedo Gunboats (Sharpshooter class).

To enable this new work to be begun, and to complete 26 out of the 30 ships now building, as well as push on the repairs and reconstructions above mentioned, the Vote for Shipbuilding, Repairs, Maintenance, &c. (Vote 8), has been increased by £615,900. The sum of £202,465 is the net increase on that part of this expenditure, as detailed in Vote B., appended to the Navy Estimates.

Speed trials.

A special order has been issued during the year, by which a higher rate of speed than that known as "economical speed" has been directed for the future to be periodically maintained by Her Majesty's Ships when making passages. The reasons for, and objects of, this order are explained in the Circular Letter in the Appendix.

NAVAL ORDNANCE.

The transfer to Naval Votes of the cost of Naval Ordnance has been associated during the past year with the difficulties which the assumption of new duties and responsibilities generally entails. In this instance they have been aggravated by the necessity of the

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Admiralty employing as their agents the very Department with whom they were not always in accord upon questions where the interests of the Army and Navy were not identical.

Considering the controversial nature of the points to be settled and the financial bearing upon the expenditure of the two departments by the division of the stores hitherto held in common, the work done has been remarkable. In future years, now that the ground has been cleared, there is little likelihood of a recurrence of this kind of questions, which has now been decided once for all.

The amount of the deficiencies of Ordnance Stores for Naval Service has now been ascertained, and although they are serious it is hoped they may be made up gradually in the course of the next three years, without in the meantime running any very great risk, as, by means of the increased plant recently put up by the private trade, ammunition for the smaller kinds of guns could be produced very quickly in the event of an emergency, whilst as regards projectiles of the heavier natures, which take a long time to make, arrangements have been made for ordering these in larger proportions at once.

As is well known, there has been very great delay in completing ships with guns. This delay was due to the faulty principle which was adopted in the design of these guns, viz., that of placing liners in the bores. These liners, when the guns were proved, cracked, and very considerable delay was caused before the guns were repaired and made efficient for issue to the Fleet. The difficulty, it is believed, has now been got over, and the War Office are of opinion that the block as regards ships of the Admiral class and the belted cruisers will be removed by June, that is, in sufficient time to admit of all the ships otherwise ready taking part in the Summer Manœuvres. It is believed that no further difficulties or delays need be anticipated in the future delivery of guns, as in the gun designs now approved the features which have led to the failures above referred to have been eliminated.

With reference to the new shipbuilding programme, the whole of the requirements for the large guns (that is those taking more than a year to manufacture) have been made known to the War Office, and from reliable information, which has been received and verified by personal inquiries, there seems to be no doubt, in view of the simpler form of gun designs now adopted, and of the larger experience and greatly increased plant of the private manufacturers, that the guns will be ready in ample time for the ships requiring them.

The 4·7-inch quick-firing gun. The 4·7-inch quick-firing gun has been brought into use since the date of my last Annual Statement, and all the anticipations have

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been fully realized as to the very great advantages possessed by this type of gun, more especially in resisting the attacks of torpedo vessels, and in enabling more accurate practice to be made when ships are moving at great speed. Practice from slow-firing guns under such conditions must be most uncertain on account of the very great alteration in distance between the rounds.

Number of guns completed in the year 1888.

During the year ending 31st December, 1888, 160 new breech-loading guns have been completed for the Navy, including one 16¼-inch 111-ton gun, 6 13½-inch 68-ton, 9 12-inch 45-ton, and 6 9·2-inch 22-ton guns. During the same period 262 14-inch Whitehead Torpedoes have been manufactured and issued for Naval Service.

Experiments in 1888–89.

Experiments with explosives.

A Special Committee has been appointed by the War Office to deal with the question of high explosives; and experiments are also in progress with several descriptions of smokeless powder for use with quick-firing guns. The experiments against the Resistance with shells charged with high explosives will also now be shortly completed, and will determine several important points in reference to armament and ammunition, besides affording the required information as to the most suitable form of defence to be adopted.

On armour-plating.

The experiments on armour-plating, mentioned in my Statement last year, have been carried out successfully, valuable information having been obtained as to the relative qualities of steel-faced and steel armour when attacked by modern guns and projectiles.

Experiments with submerged torpedo discharges in vessels of high speed have been continued; and many of the special difficulties incidental to that method of discharge have been overcome.

The reduction of this Vote to £1,463,000 has been possible by the transfer to another fund of the cost of armament of the new ships which it is proposed to build by contract.

New Works.

No new works of great importance were commenced during 1888–89, but the undermentioned will be practically completed before the end of the financial year:—

Haulbowline (Extension)	The Caissons are in place.
Chatham Dockyard .	New Foundry.
Gibraltar . . .	Accommodation for Torpedo Boats.
Portsmouth . .	Torpedo Range.
	Barracks for 400 men (commenced 1889).

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The Estimate of Vote 10 for 1889–90 amounts to £451,000, being £74,700 more than that for 1888–89. Estimate in excess of that for 1888–89.

The difference is caused chiefly by the provision for—

Improved Coaling Arrangements . .	£50,000
Dredging Medway	13,000
Malta Extension—Caissons, &c. . .	11,700
	£74,700

The charges for Staff have been reduced, and also those for repairs and maintenance.

The form of the Estimate has, in compliance with the wish of the Public Accounts Committee, been changed so as to resemble as much as possible that of the Army Works Estimate.

Provision is made for the commencement of works to facilitate coaling at— Coaling arrangements.

Portland	Jetty.
Portsmouth	Railways.
Keyham	Pier, &c.

The only other large work to be commenced during 1889–90 is the important dredging of the Medway to allow of the largest men-of-war passing down the river at any high tide, the remainder of the new barracks on Whale Island, which will enable old hulks—very expensive to repair—to be given up, and the continuation of the reconstruction of the large trooping jetty at Portsmouth Dockyard.

The large extension works at Portsmouth are nearly at an end, and those at Malta are proceeding vigorously.

Personnel.

The offices of Chaplain of the Fleet and of Inspector of Naval Schools have been combined, and the arrangement seems to work satisfactorily.

The arrangements affecting instruction of Engineer students, referred to in last year's Statement, have been completed. The training is now carried on at Devonport alone. The students have been made subordinate officers of the Royal Navy. The period of instruction is to be reduced to five (and in some cases four) years. Only those who attain a certain standard at the final examination will be allowed a period of further study at the Royal Naval College; the remainder will commence service afloat at once. Engineer students.

The direct entry of Assistant Engineers at the Royal Naval College will commence in 1890. Assistant engineers.

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Engine-room staff.

It has been found necessary to increase the number of Engine-room Ratings by the following numbers:—

125 Chief or Engine-room Artificers.
780 Leading Stokers or Stokers.

Besides these numbers 200 Stokers have been added to the Coast Guard; though this addition to the Coast Guard will hardly be attained in the coming year, as only men of specified service and very good character are appointed.

Complaints have been made as to the quality of the Stokers of the 2nd class. The increase which it has been found necessary to make in this class has led to numerous entries, and as many of the men are rather young, efforts are being made to obtain men of better physique.

The chief increases in other ratings are—

Subordinate Officers . . .	280
Seamen class, Men and Boys .	390
Artificers	100
Marines	1100

including in the Marines men added to the corps on account of duties to be performed by it as Buglers, Lamptrimmers, &c., in lieu of non-combatant ratings.

Arrangements have been made for the gradual reduction of Artificer and Stoker Pensioners in the Steam Reserves, whose places will be supplied by Active Service men. The reduction is gradual, owing to the desire not to deal hardly with men who do their harbour work well, though rather old for sea service, if called on in an emergency.

Signal-men.

The pay of the Signal Class has been improved, to put them on an equality with other Seaman class ratings, who can attain the higher gunnery qualifications from which they are debarred.

The number of Signal ratings borne in Ships will be increased, and provision has been made for training more Signal Boys.

It is also intended to establish a School for higher training, and instruction given to all boys whilst in their Training Ships will be increased.

Progress has been made in reducing some of the non-combatant ratings which are to disappear entirely, or almost so.

These include—

Plumber's crew.	Tailor.
Tinsmith.	Shoemaker.
Lamptrimmer.	Barber.

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Besides these, in accordance with recommendations of the Ratings Committee or previous decisions, the following ratings will be abolished:—

Captain of the Hold.	Ropemaker.
2nd Captain of the Hold.	Sailmaker's crew.
Ordinary 2nd class.	Lithographer.
Yeoman of store room.	

Schoolmasters are to be withdrawn from all but boys' training ships, and the numbers will be considerably reduced. Those selected for the new establishment will receive improved pay and pension. The number of schoolmasters of the Royal Marines has been reduced, owing to abolition of compulsory *school* after leaving the depôt.

The carpenter class will be reduced in number by the gradual abolition of

Unskilled	Carpenter's mates.	Caulker's mate.
	Shipwright.	Carpenter's crew.
	Caulkers.	

Skilled shipwrights being substituted for the last in proportion of 2 to 3. It is estimated that 326 non-combatants can thus be reduced. Skilled Leading Shipwright, 2nd class Petty Officer, will be introduced.

The previous compulsory training of seamen gunners in torpedo duties has been made optional, and restricted to men who take 1st class in Gunnery.

Gymnastic instruction has been established in mastless ships.

These changes and the increase to the number voted last year have caused a rise in Votes 1 and 2 of £275,300, as compared with the estimate of the preceding year. Of this amount, £78,900 is contained in a new Vote, No. 14, which deals with half-pay as a separate item. Half-pay in the previous year was contained in a subhead of Vote 1.

Royal Naval Reserves.

Honorary Commissions as Commander and Chief Engineer will be conferred, in certain cases, on Marine Superintendents and Engineer Superintendents of large Ship Companies.

A large number of officers will be admitted for the year's training in the Royal Navy.

It is proposed to relax the rules as to appointment of sub-lieutenants, with the view of giving more commissions to officers of large mail lines, who are at present under some disadvantage, as their advancement in the service in which they are employed is rather slow.

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Royal Marine Forces.

Notwithstanding the heavy demands made upon marine head-quarters to meet the additional requirements of the fleet, the various drills and courses of instruction have been kept up, and the efficiency of the corps fully maintained.

Increased attention has been paid especially to naval gun drill training, and much improvement effected in the armaments of the gun drill batteries.

Classes for military training of officers and men, and reconnaissance and field sketching classes for non-commissioned officers, have been established. Regular classes of officers for the study and practice of the war game have also been introduced at each divisional head-quarters with good results.

Discipline has been well maintained. Convictions by court martial have been for many years steadily on the decrease, and in spite of the drain on the corps by the facilities freely offered to all ranks to take their discharge and to be transferred to the Navy, Army and Auxiliary Forces, the Marines find no difficulty in enlisting a most desirable class of recruits, which speaks well for the popularity of the corps.

In view of the growing demands of the Navy and the adaptability of the non-commissioned officers and men of the Marines to fulfil many duties on board ship hitherto performed by non-combatants, it has been considered advisable to increase the strength of the corps from 12,900 to 14,000—the increase going to the Infantry branch.

During the mobilization of the fleet, the various detachments were embarked with readiness and despatch.

George Hamilton.

4th March, 1889.

Admiralty, S.W.,
1st February, 1889.

Sir,

With reference to the instructions respecting the "most economical rate of the speed," and the "full power trials" of Her Majesty's ships, which are contained in Articles 894 and 896 of the Queen's Regulations, I am commanded by my Lords Commissioners of the Admiralty to signify their directions to you as follows:—

2. Half-yearly full power trials of ships are to be discontinued, and quarterly passage trials are to be made in lieu.

3. Each quarterly trial is to consist of a passage which is to be run whenever circumstances will permit, with the engines working at from one-half to two-thirds of their specified natural draught power.

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4. During each passage trial, the engines are to be run for a period of four hours at their highest speed with natural draught. In ships with closed stokeholds, the air pressure during this four hours' run should not exceed half an inch of water.

5. My Lords do not propose to lay down any rule as to the rate of speed at which ordinary passages of Her Majesty's ships are to be made. This is left to the discretion of the Commander-in-Chief and senior officers, who will decide after taking into consideration the nature of the service which has to be performed.

6. My Lords also leave it to the discretion of the Commander-in-Chief to order a full power trial of the machinery of a ship in any case in which he may consider it desirable that such a trial should be made.

7. I am further to inform you that my Lords consider it very undesirable that deck hands should be employed to assist the stokers when the engines are running at full speed, unless it should be found absolutely necessary to do so.

8. The necessary alterations in the Queen's Regulations will be embodied in the next quarterly Errata.

I am, Sir,
Your Obedient Servant,
EVAN MACGREGOR.

The Commander-in-Chief,
on the ———— Station.

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IX.

Action taken by the Board of Admiralty with regard to the Preparation of Designs for First Class Battle Ships.

A.—Alternative Designs for First Class Battle Ships.

Board Meeting of August, 1888.

On the 17th August, 1888, a special meeting of the Board of Admiralty took place at Devonport (during the annual inspection of the yard) for the purpose of discussing the principal features to be embodied in the designs of first class battle ships proposed to be laid down in 1889–90.

The members of the Board had before them the particulars of the designs of the most recent battle ships constructed, or in course of construction, for the Royal Navy and for Foreign Navies; and passed in review the systems of armament and protection embodied in various types.

The questions of speed, coal-endurance, freeboard, principal and secondary armament, armour protection, &c., were all separately considered, and a provisional decision arrived at for the guidance of the Director of Naval Construction in preparing alternative outline designs to be subsequently submitted to the Board.

Approved disposition of the armament for new battle ships.

After contrasting and comparing the various *dispositions of armament* illustrated in different types of battle ships, it was unanimously agreed that the following principles should be complied with in disposing the armament of the new battle ships:—

1. That there should be four heavy guns placed in two protected stations situated at a considerable distance apart, each pair of guns having an arc of training of about 260°, equally divided on each side of the line of keel. All four of these guns to be available on each broadside.
2. That the greater portion of the auxiliary (or secondary) armament should be placed in a long central battery situated between the two heavy gun stations, and so disposed that there should be practically no interference with the fire of any one gun by that of any other.

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3. That in view of the development of high explosives it was desirable to secure the widest possible distribution of the guns in the auxiliary armament; and that it was preferable to mount the auxiliary armament on two decks, one of them being the spar deck, rather than to carry the guns chiefly between decks.

The best modes of protecting the guns and guns' crews in the auxiliary armament were debated, but a final decision was reserved until the experiments intended to be carried out in the Resistance had been completed.

Alternative dispositions of armament considered and not approved.

This disposition of the armament was not decided upon without careful comparison of its advantages and disadvantages with those of other systems. For example, the system exemplified in the Imperieuse and Warspite, and in many foreign ships where the protected stations are multiplied and each contains one heavy gun.

The isolation of single heavy guns was seen to have some advantages: but experience in the Warspite and Imperieuse had shown that with this disposition of the heavy guns there must be a considerable interference with the efficiency and power of independent action of the auxiliary armament; and to protect these four separate positions necessarily required the expenditure of a very much greater weight of armour for a given thickness than was involved in the construction of two stations each containing two guns.

Other plans for carrying the heavy guns in positions where their comparative *concentration* would enable a reduced area of protective armour to suffice also came under review.

Many illustrations of the general idea of concentrated heavy armaments were considered; including "central citadels" with the heavy guns carried in turrets or barbettes, and placed either abreast one another, or *en echelon;* central batteries with broadside armaments; or citadels placed high above water, and isolated from the hull armour.

It was considered that the objections to all these plans were too serious to permit of their adoption; and that these objections might be grouped under two principal heads, viz.:—

1. The great risk of the principal armaments being placed *hors de combat* by the explosion of a single heavy shell within or under the armoured enclosure:
2. The enormous difficulties which this disposition of the main armament introduced into the efficient working of a powerful and numerous auxiliary armament.

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Recent dispositions of armaments in foreign ships.

It was also noted before recording the decision above-mentioned, that in some of the most important Foreign Navies, where one or other of these modes of disposing the armament had been adopted, and the principles either of extreme distribution or of relative concentration had been carried out, the latest designs had contained arrangements similar to those decided upon as best for future battle ships in the Royal Navy; which disposition is also to be found in vessels like the Trafalgar, and in the Admiral class.

Points left open for further consideration.

This decision of the Board respecting the best disposition of the armament necessarily exercised a preponderating influence upon the preparation of all the designs in which it should be embodied. But it left open the question of the extent and character of the protection to be given to the ships by means of vertical and deck armour, as well as the protection of the armament, and the adoption of the turret or barbette systems. It was desired to base a decision on these features upon the consideration of alternative designs for ships of about the same size and cost, which should provide for either the barbette or the turret systems of mounting the heavy guns, and for moderate or high freeboard at the extremities.

Calibre of heavy guns.

After full consideration, the Board came to the conclusion that each first class battle ship should carry four 13½-inch 67-ton B.L. guns, as the principal armament, thus corresponding to that carried by the Trafalgar and other recent battle ships.

Nature of auxiliary armament.

Further, that the auxiliary armament should include ten 6-inch guns (preferably of the quick-firing type) and a considerable number of 3-pr. or 6-pr. quick firing and machine guns.

Length of armour belt.

It was provisionally decided also that the length of the armour belt in the region of the water line in the new ships should bear the same ratio to the total length of the ship as in the Trafalgar.

Outline designs considered by the Board.

On these and other instructions received subsequently from the Board as to details, a considerable number of outline designs were prepared, for both turret and barbette ships; and detailed particulars of relative sizes and costs were placed before the Board.

In the interest of the public service it is not desirable that this detailed information should be made public, but the following brief summary and illustrative diagrams will indicate the principal features in the designs from amongst which a selection was eventually made.

For convenience these may be arranged in two groups; viz., the turret ships and the barbette ships.

Trafalgar as designed and completed.

The Trafalgar was taken as the typical turret ship with which to compare the other designs.

The principal particulars of the Trafalgar *as designed*, are given

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in column 1 of the tabular statement herewith; and the general disposition of the armour and armament are illustrated in *Pl. 26* of *The Naval Annual.*

It must be stated that, while the particulars given in the table are for the Trafalgar as designed, the completed ship will probably be about 10 inches in excess of the designed draught, and about 500 tons in excess of her designed displacement, various additions having been made to the armour and armament, &c., during her construction.

Furthermore, in the case of the Trafalgar, the nominal load displacement, as designed, does not include the Board margin of 4 per cent. which now has to be provided in all new designs, and which, in her case, would involve a further addition of about 10 inches to the draught if she were being re-designed.

In other words, if a simple repeat of the Trafalgar were now ordered, it would be necessary to considerably increase the length, and with it to lengthen the belt of armour, in order that the necessary displacement might be provided within the limits of draught accepted in the original design; provision being made at the same time for the Board margin of 4 per cent. on the displacement.

New designs for turret ships with 4 per cent. Board margin.

In all the alternative designs for turret ships put before the Board, the mean draught of 27½ feet has been treated as a maximum, the freeboard has been kept the same as in the Trafalgar, the height of the turret guns above water has been increased about 2 feet, and the more powerful auxiliary armament has been embodied, being accommodated in a longer central battery than exists in the Trafalgar.

In all these designs the water-line has been protected by a belt of armour extending for about two-thirds the length of the ship, the depth of the armour below water being 5½ feet, and the height of the belt above water 3 feet.

Citadel and Redoubt systems in turret ships.

Two alternative arrangements have been considered for the protection of the turret bases and loading apparatus. In the first the turrets stand at the end of a long armoured citadel, extending to the full breadth of the ship, and with vertical armour on the sides rising to a height of about 11 feet above water. The upper deck over this citadel is protected by 3-inch steel. In the alternative arrangement the 3-inch steel deck is placed at the height of the top of the belt armour, and each of the turrets is placed in a separate lozenge-shaped redoubt, strongly armoured and enclosing not merely the turret bases, but also the upper portion of the ammunition hoists and the loading appliances.

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The broadside of the ship in this case is protected from the top of the belt to a height of about 10 feet above water by vertical armour 5 inches thick, extending over practically the same length as the citadel occupies in the other plan, and the ends of the space so protected are closed in by armoured screen-bulkheads extending to the height of the spar deck.

The first arrangement is sufficiently illustrated by *Pl. 26* in *The Naval Annual* for the Trafalgar. The second is illustrated by *Pl. 26a* and *26b*, which show the principal features of the disposition of the armour in a turret ship with separate redoubts and thin side armour above the belt.

As a matter of information the particulars of two designs, one armoured on the citadel plan, and the other with separate redoubts, are given in columns 2 and 3 of the tabular statement, page 563. These two ships, it will be observed, are identical in dimensions, in water-line protection, armament, engine-power, speed, and coal supply. In the one case, with a continuous citadel, the armour on the turret is 15 inches, and that on the citadel sides 14 and 12 inches; whereas in the ship with separate redoubts the armour on the turrets is 18 inches, and that on the redoubts 17 inches: the broadside armour is 5 inches thick above the belt.

It will be seen, therefore, that the adoption of the redoubt system, when it is associated with a long central battery, containing the powerful auxiliary armament provisionally decided upon, enables a very appreciable increase to be made in the defence of the turret bases, the turret guns, and of all the loading appliances, as compared with what is possible when the continuous citadel is adopted.

It should be explained that in both cases the defence afforded by the side armour fitted above the belt will be reinforced by continuous coal bunkers, which, when filled will contribute to the defence, and when empty will form cellular compartments in the rear of the armour.

Designs for ships of greater size, speed, and cost.

Keeping to the main features illustrated in the two designs, thus briefly described, investigations were made also to determine what additional cost would be involved in adding to the speed and coal endurance as designed for the Trafalgar; and particulars of the approximate dimensions and cost of two turret ships having a natural draught speed of 17 knots, a coal endurance about 30 per cent. greater than that of the Trafalgar, and similar belt protection, were placed before the Board for consideration.

It is unnecessary, however, to reproduce these particulars, as it was decided that it would be undesirable to incur the extra expense

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and increase of size involved in securing these variations from the design of the Trafalgar.

Designs for turret ships of 12,000 tons (with Board margin).

Furthermore, an investigation was made as to what could be done on a displacement of about 12,000 tons inclusive of the Board margin of 4 per cent., if the same freeboard, speed, and coal endurance were accepted as were designed for the Trafalgar, the same proportionate length of armour belt adopted, and the auxiliary armament kept identical with that in all the other designs.

The results are shown in column 4 of the appended tabular statement, and as there given they correspond to a double turret ship with each turret placed in a separate redoubt.

Designs for barbette ships.

For purposes of comparison with the turret ship designs, a series of designs was also prepared for several barbette ships, in which should be embodied the following features:—Greater height of freeboard at the ends; four heavy guns placed high above water in two separate barbettes; and a central battery containing an auxiliary armament identical with that provided for in the turret ships.

Differences from ships of Admiral class.

These designs differed from the preceding barbette ships of the Admiral class in two essential features, which will be sufficiently understood by reference to *Pl. 5* and *Pl. 8* in *The Naval Annual*, and also in *Pl. 8a* and *Pl. 8b*.

Pl. 5 and *Pl. 8* show the disposition of the barbettes in the Admiral class. It will be seen that the armoured barbettes are carried at a considerable height above the armoured portion of the hull, the connection for the ammunition hoists and passages being protected by armoured tubes.

In these features the Admiral class resemble the barbette ships in foreign navies; but in the strength of the protective armour on the tubes, and in the general protection of the loading arrangements and gun mountings, the English type of barbette is far superior to that to be found in most foreign war-ships.

It was decided, however, in view of the great development of high explosives, that in any new designs for barbette ships the proportion of the length at the water line protected by the belt of armour should be greater than the corresponding proportion in the Admiral class; and further, that the armoured barbette towers should be carried down to the top of the belt in order that there should be no possibility of the bursting of shells containing large explosive charges under the floors of the barbettes upon which the revolving gun platforms are carried. This feature is illustrated in *Pl. 8a* and *Pl. 8b*.

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The second point of difference, as compared with the Admiral class, is to be found in the increased freeboard at the extremities.

It was decided that in the barbette designs the broadside from the top of the belt armour, to a height of about 10 feet above water, should be protected by armour of moderate thickness, as in the redoubt turret ship, illustrated by *Pl. 8a* and *Pl. 8b*.

The series of designs for barbette ships was practically co-extensive with that for the turret ships. In order that a definite comparison might be made, each design for a turret ship was associated with a design for a barbette ship of identical external dimensions and draught, the same displacement, the same coal endurance and armament, the same extent and character of armoured protection at the water-line belt and on the broadside, and the same thickness of protective deck.

In the tabular statement, page 563, are given the particulars, in columns 6 and 7, of two of these barbette designs, as well as the corresponding particulars for the Anson as built.

Comparison of barbette and turret designs.

The two new barbette designs will be seen to correspond respectively in dimensions, displacement, &c., with the two turret ship designs, of which particulars are given in columns 3 and 4.

It was furthermore arranged that in each case the cost of the barbette ships and of the turret ships should be practically identical.

It will be seen that the heavy guns in the barbette ships are carried 6 feet higher above water than in the turret ships, and that the height of freeboard forward and aft in the barbette ships is 18 feet, as against about 11¼ feet in the turret ships.

Protection of the auxiliary armament and crews of guns.

One point which received the most careful consideration in relation to all the designs, whether for turret or barbette ships, was the protection proper to be given to the guns in the auxiliary armament, in view of the development of high explosives and quick-firing guns of large calibre.

On this matter a provisional decision was reached, and experiments were arranged which are now about to be completed in the Resistance.

But pending the completion of these trials and their analysis, it is undesirable to make public any particulars of the methods likely to be adopted.

It will be sufficient to say that a liberal allowance of weight has been made for the protection of the guns in the auxiliary armament and of the guns' crews, as well as for the rapid transport of the ammunition and its protection in all the stages of its passage from the magazines to the guns.

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TABULAR STATEMENT GIVING PARTICULARS OF OUTLINE DESIGNS FOR FIRST-CLASS BATTLE-SHIPS.

	1 Trafalgar (as designed).	2 Citadel turret ship.	3 Redoubt turret ship (Design C).	4 Redoubt turret ship.	5 Barbette ship, Admiral type (Completed).	6 Barbette ship (Design c).	7 Barbette ship.
Length .. .. feet	345	380	380	350	330	380	350
Breadth .. .. feet	73	75	75	70	68½	75	70
Draught (mean) .. .. feet	27½	27½	27½	27	27–10	27½	27½
Displacement (approximate) .. .. tons	12,000	14,000	14,000	12,000	10,550	14,000	12,000
Freeboard, forward and aft .. .. feet	11¼	11¼	11¼	11¼	10¼	18	18
Heavy guns above water .. .. feet	15	17	17	17	20	23	23
Horse power, forced draught	12,000	13,000	13,000	12,000	11,000	13,000	12,000
Speed, forced draught .. .. knots	16½	17	17	17	16¾	17	17
Speed, natural draught .. .. knots	15	15	15	15	15	15	15
Coal carried .. .. tons	900	900	900	900	900	900	900
Armament, main	4 67-ton B.L.	4 67-ton B.L.	4 67-ton B.L.	4 45-ton B.L.	4 67-ton B.L.	4 67-ton B.L.	4 45-ton B.L.
	8 5-inch B.L.	10 6-inch Q.F.	10 6-inch Q.F.	10 6-inch Q.F.	6 6-inch B.L.	10 6-inch Q.F.	10 6-inch Q.F.
auxiliary	8 6 prs.	10 6-prs.	10 6-prs.	10 6-prs.	12 6-prs.	16 6-prs.	16 6-prs.
	10 3-prs.	8 3-prs.	8 3-prs.	8 3-prs.	7 3-prs.	8 3-prs.	8 3-prs.
Length of belt .. .. feet	230	250	250	230	150	250	230
Armour .. .. belt .. .. inches	20 to 14	18 to 14	18 to 14	14	18	18 to 14	14
turrets .. .. inches	18	15	18	13	—	—	—
citadel, redoubts, or barbettes .. inches	18	14	17	13	14	17	13
side between bases of barbettes or turrets .. .. inches	16	12	5	4	Unprotected.	5	4
armour tube, or base of barbettes .. inches	—	—	—	—	12	17	13
conning tower .. .. .. inches	14	14	14	14	12	14	14
auxiliary armament	Unprotected.	Protected.	Protected.	Protected.	Unprotected.	Protected.	Protected.

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B.—Notes of Discussion on Designs for Battle Ships.

On the 16th November, 1888, a meeting took place in the First Lord's Room, which was attended by the undermentioned Officers for the purpose of discussing the alternative designs for First Class Battle Ships, which had for some time past been under the consideration of the Board, and particulars of which for some time had been distributed to the other Naval Officers present.

Present:—

The Right Hon. the Lord George Hamilton, M.P.
Admiral Sir Arthur Hood, K.C.B.
Vice-Admiral Sir A. H. Hoskins, K.C.B.
Rear-Admiral J. O. Hopkins, Controller of the Navy.
Rear-Admiral C. F. Hotham, C.B.
A. B. Forwood, Esq., M.P.
Admiral Sir W. Dowell, K.C.B.
Admiral Sir R. Vesey Hamilton, K.C.B.
Vice-Admiral Sir F. Richards, K.C.B.
Vice-Admiral J. K. E. Baird.
Captain Lord Walter Kerr, R.N., A.D.C.
The Director of Naval Ordnance, and
The Director of Naval Construction.

Rear-Admiral Sir George Tryon, K.C.B., was unavoidably prevented from attending the meeting, but had placed his views on the subject before the First Lord.

At the commencement of the proceedings the First Lord explained that it was the desire of himself and the members of the Board to obtain the opinions of the representative Naval Officers present, who had recently had experience as Commanders-in-Chief on different Stations, and in the Manœuvres, as regards the principal features that should be embodied in the design of a First Class Battle Ship, in order that modern conditions might be most satisfactorily fulfilled.

To facilitate the discussion, reference would be made to the alternative designs for First Class Battle Ships, with special reference to the designs of vessels of about 14,000 tons displacement.

Taking the several features of the designs in order, the opinion of the Naval Officers was invited on the following points:—

1. *Speed.*

Were the speeds of 15 knots for continuous steaming (with natural draught under favourable circumstances) and about 17 knots as the

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maximum speed (with forced draught), regarded as sufficient for First Class Battle Ships?

The general opinion was that these speeds were sufficient in view of the considerable increase in size and cost involved in obtaining higher speeds; and that it would be preferred with a given expenditure to have a larger number of vessels possessing these speeds, rather than one or two vessels of higher speed.

2. *Disposition of Armament.*

After some discussion, and after further explanations had been given of the alternative arrangements for disposing armaments in use in other navies, it was unanimously agreed that the general features of the disposition of the heavy guns, and of the auxiliary armament, illustrated in the vessels of the Admiral class, as well as in the Nile and Trafalgar, were on the whole the best possible.

It was recognised that the distribution of the heavy guns in a larger number of armoured enclosures (as in the Imperieuse class of the Royal Navy, and in the majority of the Battle Ships of the French Navy) had its advantages; but that the concurrent disadvantages in relation to the greater weight of armour required for the protection of the guns, and the interference of the fire of the heavy guns with the auxiliary armament, more than compensated for those advantages.

Furthermore, it was agreed that the principle of concentrating the heavy guns amidships, in order to increase the thickness of armour by diminishing its area, was not one which should be adopted, in view of the risks of the simultaneous disablement of the heavy guns incidental to that arrangement, and of the interference of the fire of those guns with the effective fighting of the auxiliary armament.

3. *Distribution of Armour.*

(*a.*) Water line protection.—Was it desirable to carry on the belt to the stem and stern, instead of having *unarmoured ends*?

It was generally agreed that when the belt was carried over such a large portion of the length of the ship as in the designs under consideration, so that the spaces above the protective deck, before and abaft the belt were of small capacity, and the entry of water to them would produce only small sinkage and very moderate change of trim, it was preferable to dispose the weight available for water line protection in the form of thicker armour on the belt not carried to the ends.

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The question of fitting thin armour over the bow from the protective deck upwards was also discussed in its relation to the prevention by such thin armour of the riddling of the ends by the fire of light guns, which riddling might possibly admit considerable quantities of water forward and prevent the vessel being driven hard in a seaway.

It was agreed that if such armour were fitted at all it should be carried to a considerable height above the normal water line, which would involve a considerable additional weight; and, in the opinion of nearly all who took part in the discussion, it was preferable, if any weight were disposable for increasing the thickness of the armour, to utilize it in increasing the thickness of the armour on the broadside from the belt up to the main deck, rather than to dispose of it in the form of protection to the unarmoured bow.

(*b*) The alternative dispositions of armour shown on the designs of which particulars are given in columns 2 and 3 of the Tabular Statement annexed to the description of the alternative designs were also considered, with special reference to the relative thicknesses of armour stated to be admissible in those two designs.

After full discussion it was agreed—

(*a*) That it was preferable to have two separate strongly protected stations for the four heavy guns, rather than to have a single citadel.

(*b.*) That on the whole the 4-inch armour amidships from the belt deck to the main deck, associated as it would be with the internal coal-bunker, subdivided into numerous compartments, might be considered satisfactory; but that if armour weight became available it could be profitably utilized in thickening the 4-inch steel above the middle portion of the belt.

This was subsequently made 5-inch.

(*c.*) It was also generally agreed that proper protection should be given to the guns and guns' crews of the auxiliary armament.

4. *Freeboard and the Maintenance of Speed at Sea.*

It was agreed that for the maintenance of speed and fighting power at sea, the high freeboard and high placed guns in design for barbette ship (column 6 of Tabular Statement) were preferable to the lower freeboard and less height of guns in design for the turret ship of same displacement (column 3 of Statement).

5. *Barbettes versus Turrets.*

The advantages and disadvantages of both systems having been reviewed, it was agreed (in view of the vessels existing in Foreign

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Navies or now under construction) that the barbette arrangement in design (*c*) was to be preferred in a Battle Ship intended for general sea-going purposes.

Sir Arthur Hood recommended that of the ships proposed to be laid down in 1889-90, in the dockyards, one should be on the turret system.

6. *Nature of heavy Armament.*

There was a considerable weight of opinion that a 12-inch gun of modern design and of about 50 tons in weight might be made, which would possess sufficient power for most purposes; but as no such gun was in existence, and as guns of 75 tons in weight were carried in existing foreign ships, while the 67-ton 13½-inch gun was thoroughly successful, and all the details of the ammunition and mountings had been settled, it was generally agreed, that for the three leading Battle Ships, 67-ton guns were to be preferred for the heavy armament.

Certain matters of detail in relation to the equipment of the vessel, the masting, signalling, boats, &c., were also discussed.

J. O. HOPKINS,
REAR-ADMIRAL,
CONTROLLER OF NAVY.

NOTE.—Designs C and *c* were subsequently ordered by the Board to be worked out in detail for guidance in building.

It has been found possible to increase the speeds to about 16 knots with natural draught, and 17½ knots with forced draught, in the completed designs.

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X.—Abstract of Navy

Votes.		Estimates, Gross Estimate.	Estimates, Appropriations in Aid.
	I.—Numbers.		
A.	Total Number of Officers, Seamen, Boys, Coastguard, and Royal Marines	..	..
	II.—Effective Services.	£	£
1	Wages, &c., of Officers, Seamen and Boys, Coastguard, and Royal Marines	3,304,496	102,796
2	Victualling and Clothing for the Navy . . .	1,339,609	278,509
3	Medical Establishments and Services . . .	141,230	19,330
4	Martial Law	11,444	44
5	Educational Services	92,080	20,180
6	Divine Service	32,460	560
7	Royal Naval Reserves	147,575	75
8	Shipbuilding, Repairs, Maintenance, &c.:		
	Section I.—Personnel	1,640,400	21,100
	Section II.—Matériel	1,678,500	203,000
	Section III.—Contract Work	1,565,000	..
9	Naval Armaments	1,463,500	..
10	Works, Buildings, and Repairs at Home and Abroad .	457,000	6,000
11	Miscellaneous Effective Services	131,550	2,750
12	Scientific Services	69,198	11,298
13	Admiralty Office	225,920	8,520
	Total Effective Services . . £	12,299,962	674,162
	III.—Non-Effective Services:		
14	Half-Pay	78,916	16
15	Reserved and Retired Pay	718,525	25
16	Naval Pensions	757,915	215
17	Widows' Pensions and Compassionate Allowances .	168,300	..
18	Civil Pensions and Gratuities	338,192	1,992
	Total Non-Effective Services . £	2,061,848	2,248
	Grand Total . . £	14,361,810	676,410

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ESTIMATES for 1889-90.

1889-90.	Estimates, 1888-89.			Difference on Net Estimates.		Votes.
Net Estimate.	Gross Estimate.	Appropriations in Aid.	Net Estimate.	Increase.	Decrease.	
Total Numbers. 65,400	..	..	Total Numbers. 62,400	Numbers. 3,000	Numbers. ..	A.
£	£	£	£	£	£	
3,201,700	3,214,607	101,907	3,112,700	89,000	..	1
1,061,100	1,237,800	281,400	956,400	104,700	..	2
121,900	139,130	19,630	119,500	2,400	..	3
11,400	11,520	20	11,500	..	100	4
71,900	92,522	19,022	73,500	..	1,600	5
31,900	33,600	500	33,100	..	1,200	6
147,500	143,860	60	143,800	3,700	..	7
						8
1,619,300	1,637,556	31,356	1,606,200	13,100	..	Sec. I.
1,475,500	1,135,125	211,625	923,500	552,000	..	Sec. II.
1,565,000	1,514,200	..	1,514,200	50,800	..	Sec. III.
1,463,500	1,863,500	..	1,863,500	..	400,000	9
451,000	382,300	6,000	376,300	74,700	..	10
128,800	119,950	2,950	117,000	11,800	..	11
57,900	65,460	9,860	55,600	2,300	..	12
217,400	220,920	8,820	212,100	5,300	..	13
11,625,800	11,812,050	693,150	11,118,900	909,800	402,900	
78,900	..	..	..	78,900	..	14
718,500	721,091	91	721,000	..	2,500	15
757,700	743,648	48	743,600	14,100	..	16
168,300	168,500	..	168,500	..	200	17
336,200	331,283	483	330,800	5,400	..	18
2,059,600	1,964,522	622	1,963,900	98,400	2,700	
13,685,400	13,776,572	693,772	13,082,800	1,008,200	405,600	
				Net Increase, £602,600		

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STATEMENT showing the Actual and Estimated EXPENDITURE for NAVAL SERVICES for the Three Years ending the 31st March, 1890.

		£	s.	d.
1887–88	Estimated Expenditure (after deducting Appropriations in Aid)	12,476,800	0	0
	Net Expenditure, as per Final Account	12,348,894	17	5
	Net Surplus (Expenditure less than Estimate)	£127,905	2	7
1888–89	Estimated Expenditure (after deducting Appropriations in Aid)	£13,082,800	0	0
1889–90	Estimated Expenditure (after deducting Appropriations in Aid)	£13,685,400	0	0

STATEMENT of the Principal Points of DIFFERENCE between the ESTIMATES of 1888–89 and those for 1889–90.

INCREASES.	£	£
Wages, &c. of Officers, &c.		170,600
Victualling and Clothing		104,700
Medical Establishments and Services		2,000
Royal Naval Reserves		3,700
Reduction in Contribution paid by the War Department for use of Her Majesty's Troop Ships		18,100
Naval Stores (including Coal)		554,900
Machinery for Her Majesty's Ships (Contract)		124,700
Gun Mountings and Torpedo Carriages (Contract)		54,500
Machinery for Shore Establishments (Contract)		8,500
Royal Reserve of Merchant Cruisers		17,000
Works, Buildings, &c.		74,700
Passage Money and Conveyance of Officers, Seamen, &c.		4,000
Photographic Mapping of the Heavens		2,700
Salaries, Admiralty and other Establishments		7,600
Non-Effective Services		16,800
Miscellaneous Services		6,300
		1,170,800
DECREASES.	£	
Educational Services	5,200	
Sale of Old Stores, Ships, &c.	9,000	
Ships Building by Contract	154,000	
Armaments	400,000	
		568,200
NET INCREASE	£	602,600

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rEMENT showing the Total Estimated EXPENDITURE for the NAVAL SERVICE including Amounts provided in the NAVY ESTIMATES, as well as in the CIVIL SERVICE and other ESTIMATES, for the following Services:—

		1889-90.	1888-89.
		£	£
Y ESTIMATES:—			
stimated Expenditure (after deducting Appropriations in Aid)		13,685,400	13,082,800
L SERVICE ESTIMATES:—			
stimated Expenditure under—			
Class I. Vote 5.—Public Buildings, Great Britain:			
Maintenance and Repairs, including New Works, Alterations, &c.	£ 1,950		
Rents, Insurance, Tithes, &c.	4,000		
Fuel, Light, Water, &c.	2,800		
		8,750	10,250
Class I. Vote 6.—Admiralty, Extension of Buildings		5,000	..
„ I. „ 7.—Furniture of Public Offices, Great Britain		1,400	1,400
„ I. „ 12.—Surveys of the United Kingdom		100	100
„ I. „ 20.—Rates on Government Property		51,000	51,000
„ I. „ 22.—Public Buildings, Ireland:—			
Coast Guard, viz:	£		
New Works and Alterations	4,000		
Maintenance and Supplies	5,914		
Furniture, Fittings, &c.	336		
	10,250		
Naval Reserve	3,800		
		14,050	16,030
Class II. Vote 12.—Exechequer and Audit Department (Cost of Audit)		10,649 (a)	10,286
„ II. „ 24.—Stationery and Printing		48,500	44,345
„ III. „ 1.—Law Charges, England (Net)		2,809	2,801
„ III. „ 11.—Prisons, England:—			
Maintenance of Naval Prisoners		1,392	1,034 (b)
„ III. „ 19.—Prisons, Scotland		55	100
„ III. „ 30.—Prisons, Ireland		73	116
VENUE DEPARTMENTS:—			
Post Office.—Postage of Official Correspondence		13,065	14,560
REENWICH HOSPITAL FUNDS		3,098	2,941
TOTAL		£13,845,341	13,237,763 (b)

(a) Exclusive of the Cost of any Staff which may be required for the Audit of the Navy Expense Accounts, a matter which is not yet finally settled.

(b) £50,468 for Convict Labour was included with this sum in the Estimates for 1888-89. No corresponding sum is included in 1889-90.

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GENERAL SUMMARY of the Estimated DIRECT and INDIRECT REPAIRS, &c., and other

DESCRIPTION OF EXPENDITURE.	ESTIMATED			
	DOCKYARD WORK.			
	Labour Expended.		Net Value of Materials Issued.	
	Dockyards at Home.	Dockyards Abroad.	Dockyards at Home.	Dockyards Abroad.
	£	£	£	£
NEW CONSTRUCTION:				
Dockyard-Built Ships:				
Hulls	659,603	2,600	719,839	1,010
Propelling and other Machinery				
Other Fittings. . . .				
Total Dockyard-Built Ships .	659,603	2,600	719,839	1,010
Contract-Built Ships:				
Hulls	27,050	..	42,420	..
Propelling and other Machinery.				
Other Fittings. . . .				
Total Contract-Built Ships .	27,050	..	42,420	..
Sundries	..	..	..	..
TOTAL NEW CONSTRUCTION (excluding Establishment, &c., Charges) . . .	**686,653**	**2,600**	**762,259**	**1,010**
RE-CONSTRUCTION . . .	47,700	..	9,120	..
REPAIRS, ALTERATIONS, AND REFITS TO SHIPS FOR RELIEFS OR RE-COMMISSION . . .	117,800	27,984	100,880	24,500
REPAIRS TO SHIPS IN COMMISSION AND RESERVE . .	123,886	39,086	74,731	37,352
TOTAL RE-CONSTRUCTION, REPAIRS, &c., (excluding Establishment, &c., Charges)	298,386	67,070	184,731	61,852
TOTAL NEW CONSTRUCTION, RE-CONSTRUCTION, REPAIRS, &c. (excluding Establishment, &c., Charges) .	976,039	69,670	946,990	62,862
SEA STORES FOR SHIPS . . .	..	..	215,000	79,550
COALS FOR STEAMING . .	..	..	81,000	251,000
TOTAL DIRECT EXPENDITURE (Carried forward).	976,039	69,670	1,242,990	393,412

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EXPENDITURE upon NEW CONSTRUCTION, RE-CONSTRUCTION, SERVICES, for the Year 1889-90.

EXPENDITURE DURING 1889-90.

CONTRACT WORK, &c.							GRAND TOTAL, DOCKYARD AND CONTRACT WORK.
Propelling and other Machinery.	Hulls, &c., Building by Contract.	Purchase of Ships and Vessels.	Repairs, &c., by Contract.	Inspection of Contract Work.	Gun Mountings and Torpedo Gear.	TOTAL.	
£	£	£	£	£	£	£	£
.. ..	..	..	..	..	.. ..	..	..
621,665	..	..	..	..	..	621,665	..
.. ..	..	..	..	..	166,601	166,601	..
621,665	..	..	..	..	166,601	788,266	2,171,318
..	205,186	..	..	..	.. ..	205,186	..
131,212	..	..	..	..	..	131,212	..
..	..	..	..	..	24,424	24,424	..
131,212	205,186	..	..	..	24,424	360,822	430,292
20,453	6,450	..	..	..	4,883	31,786	31,786
773,330	**211,636**	..	..	..	**195,908**	**1,180,874**	**2,633,396**
69,504	..	..	..	..	25,560	95,064	151,884
43,599	..	..	..	..	26,271	69,870	341,034
23,378	..	..	25,000	..	19,404	67,782	342,837
136,481	..	..	25,000	..	71,235	232,716	**835,755**
909,811	**211,636**	..	**25,000**	..	**267,143**	**1,413,590**	**3,469,151**
..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..
909,811	211,636	..	25,000	..	267,143	1,413,590	3,469,151

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GENERAL SUMMARY of the Estimated DIRECT and INDIRECT REPAIRS, &c., and other

DESCRIPTION OF EXPENDITURE.	ESTIMATED			
	DOCKYARD WORK.			
	Labour Expended.		Net Value of Materials Issued.	
	Dockyards at Home.	Dockyards Abroad.	Dockyards at Home.	Dockyards Abroad.
	£	£	£	£
DIRECT EXPENDITURE (Brought forward)	976,039	69,670	1,242,990	393,412
SUPPLIES TO OTHER DEPARTMENTS, &c.	3,748	2,011	897	..
TOTAL SEA STORES, &c., &c.	3,748	2,011	296,897	330,550
Manufactures	96,366	8,432	..	..
ESTABLISHMENT AND INCIDENTAL CHARGES, LABOUR, MATERIALS, &c.:				
Apportioned to Ships . .	76,644	..	23,121	..
Apportioned to Manufactures .	2,849	..	1,500	..
Unapportioned . . .	115,058	56,717	41,935	16,240
TOTAL ESTABLISHMENT AND INCIDENTAL CHARGES, LABOUR, MATERIALS, &c. . . .	**194,551**	**56,717**	**66,556**	**16,240**
GRAND TOTAL—LABOUR, MATERIALS, AND CONTRACT WORK	(a) 1,270,704	(a) 136,830	1,310,443	409,652
Add,—				
ESTABLISHMENT AND INCIDENTAL CHARGES, OTHER THAN LABOUR, MATERIALS, &c.:				
Apportioned to Ships . .	.. ..	..	.. ..	.. ..
Apportioned to Manufactures .	.. ..	..	.. ..	.. ..
Unapportioned . . .	.. ..	..	.. ..	.. ..
Deduct,—				
Expenditure upon Manufacture of Stores included in values of Materials issued	.. ..	..	.. ..	.. ..
GRAND TOTAL OF ESTIMATED EXPENDITURE . . .	.. ..	..	.. ..	.. ..

(a) Includes £24,931 and £1,250 for Pay of Inspectors of Shipwrights at Home and Abroad respectively.

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EXPENDITURE upon NEW CONSTRUCTION, RE-CONSTRUCTION, SERVICES, for the Year 1889–90—*continued.*

EXPENDITURE DURING 1889–90.

CONTRACT WORK, &c.							GRAND TOTAL.
Propelling and other Machinery.	Hulls, &c., Building by Contract.	Purchase of Ships and Vessels.	Repairs, &c., by Contract.	Inspection of Contract Work.	Gun Mountings and Torpedo Gear.	Total.	
£	£	£	£	£	£	£	£
909,811	211,636	..	25,000	..	267,143	1,413,590	3,469,151
..	..	..	..	..	..	(a) 1,285	..
..	..	..	..	..	..	1,285	634,491
..	..	..	..	..	..	..	104,796
..	..	..	..	15,000	..	15,000	..
..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..
..	..	..	..	15,000	..	15,000	349,064
909,811	211,636	..	25,000	15,000	267,143	1,429,875	4,557,504
.. ..							243,529
.. ..							18,772
.. ..							715,905
							5,535,710
.. ..							127,919
.. .. £							5,407,791

(a) Yard Machinery for Victualling Yards.

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GENERAL SUMMARY of the Estimated DIRECT and INDIRECT REPAIRS, &c., and other

DESCRIPTION OF EXPENDITURE.	ESTIMATED			
	DOCKYARD WORK.			
	Labour Expended.		Net Value of Materials Issued.	
	Dockyards at Home.	Dockyards Abroad.	Dockyards at Home.	Dockyards Abroad.
	£	£	£	£
DIRECT EXPENDITURE (Brought forward)	976,039	69,670	1,242,990	393,412
SUPPLIES TO OTHER DEPARTMENTS, &c.	3,748	2,011	897	..
TOTAL SEA STORES, &c., &c.	3,748	2,011	296,897	330,550
Manufactures	96,366	8,432	..	..
ESTABLISHMENT AND INCIDENTAL CHARGES, LABOUR, MATERIALS, &c.:				
Apportioned to Ships	76,644	..	23,121	..
Apportioned to Manufactures	2,849	..	1,500	..
Unapportioned	115,058	56,717	41,935	16,240
TOTAL ESTABLISHMENT AND INCIDENTAL CHARGES, LABOUR, MATERIALS, &c.	**194,551**	**56,717**	**66,556**	**16,240**
GRAND TOTAL—LABOUR, MATERIALS, AND CONTRACT WORK	(a) **1,270,704**	(a) **136,830**	**1,310,443**	**409,652**
Add,—				
ESTABLISHMENT AND INCIDENTAL CHARGES, OTHER THAN LABOUR, MATERIALS, &c.:				
Apportioned to Ships	..	..	..	..
Apportioned to Manufactures	..	..	..	..
Unapportioned	..	..	..	..
Deduct,—				
Expenditure upon Manufacture of Stores included in values of Materials issued	..	..	..	..
GRAND TOTAL OF ESTIMATED EXPENDITURE	..	..	..	..

(a) Includes £24,931 and £1,250 for Pay of Inspectors of Shipwrights at Home and Abroad respectively.

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EXPENDITURE upon NEW CONSTRUCTION, RE-CONSTRUCTION, SERVICES, for the Year 1889–90—*continued.*

EXPENDITURE DURING 1889–90.

CONTRACT WORK, &c.							GRAND TOTAL.
Propelling and other Machinery.	Hulls, &c., Building by Contract.	Purchase of Ships and Vessels.	Repairs, &c., by Contract.	Inspection of Contract Work.	Gun Mountings and Torpedo Gear.	Total.	
£	£	£	£	£	£	£	£
909,811	211,636	..	25,000	..	267,143	1,413,590	3,469,151
..	..	..	..	..	..	(a) 1,285	..
..	..	..	..	..	..	1,285	634,491
..	..	..	..	..	..	..	104,798
..	..	..	..	15,000	..	15,000	..
..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..
..	..	..	..	15,000	..	15,000	349,064
909,811	211,636	..	25,000	15,000	267,143	1,429,875	4,557,504
.. ..							243,529
.. ..							18,772
.. ..							715,905
							5,535,710
.. ..							127,919
.. .. £							5,407,791

(a) Yard Machinery for Victualling Yards.

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SHIPS BUILDING or COMPLETING in HER MAJESTY'S DOCKYARDS for which MONEY has been taken in the NAVY ESTIMATES for 1889–90.

Ship's Name.	Class of Ship.	Total Cost, including Armament.	Load Displacement.	Indicated Horse-power.	Speed.	Manufacturer of Engines.	Date.		Where Built.
							Laid Down.	For Completion.	
		£							
Trafalgar	Armoured 1st Class Battle Ship.	873,038	11,940	12,000	16·5	Humphrys	Jan. 1886	Dec. 1889	Portsmouth.
Nile	Ditto ditto.	857,070	11,940	12,000	16·5	Maudslay	Apr. 1886	1890	Pembroke, completed at Portsmouth.
Camperdown	Ditto ditto.	825,448	10,600	11,500	16·75	Ditto.	1882	1889	Portsmouth.
Anson	Ditto ditto.	780,667	10,600	11,500	16·75	Humphrys	Apr. 1883	1888	Pembroke, completed at Portsmouth.
Howe	Ditto ditto.	766,597	10,300	11,500	16·75	Ditto.	June 1882	1889	Ditto.
Rodney	Ditto ditto.	824,652	10,300	11,500	16·75	Ditto.	Feb. 1882	1888	Chatham.
Hero	Armoured 2nd Class Battle Ship.	473,575	6,200	6,000	15·5	Rennie	Apr. 1884	1888	Ditto.
Warspite	Armoured 1st Class Cruiser.	653,072	8,400	10,000	16·75	Penn	Oct. 1881	1888	Ditto.
Aurora	Ditto ditto.	326,110	5,600	8,500	18·5	Thomson	Feb. 1886	1889	Pembroke, completed at Devon.
Immortalité	Ditto ditto.	332,359	5,600	8,500	18·5	Earle	Jan. 1886	1889	Chatham.
No. 1	Armoured 1st Class Battle Ship (Turret).	..	14,150	13,000	17·5	..	1889	1893	Ditto.
No. 2	Armoured 1st Class Battle Ship (Barbette).	..	14,150	13,000	17·5	..	1889	1893	Portsmouth.
No. 3	Ditto ditto.	..	14,150	13,000	17·5	..	1889	1893	Pembroke.
No. 4	Ditto ditto.	..	14,150	13,000	17·5	..	1889	1893	Ditto.
Not named.	Armoured 2nd Class Battle Ship.	..	Design not decided			..	1889–90	..	Portsmouth.
Blake	Protected, 1st Class Cruiser.	430,653	9,000	20,000	22·0	Maudslay	July 1888	1891	Chatham.
No. 1	Ditto ditto.	..	7,350	12,000	20·0	..	1889	1892	Ditto.
No. 2	Ditto ditto.	..	7,350	12,000	20·0	..	1889	1892	Devonport.

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No. 3	Ditto	ditto.	..	7,350	12,000	20·5	..	1889	1892	Portsmouth.
Vulcan	Protected Torpedo Depôt Ship		292,107	6,620	12,000	20·0	Humphrys	June 1888	1891	Ditto.
Forth	Protected 2nd Class Cruiser.		247,720	4,050	5,700	17·0	Hawthorn	Dec. 1887	Mar. 1889	Pembroke.
Severn	Ditto	ditto.	264,924	4,050	6,000	17·0	Humphrys	Jan. 1887	1888	Chatham.
Thames	Ditto	ditto.	260,845	4,050	5,700	17·0	Penn	Apr. 1884	1888	Pembroke, completed at Devonport.
Melpomene	Ditto	ditto.	173,872	2,950	9,000	19·75	Palmer	Oct. 1887	1889	Portsmouth.
Medea	Ditto	ditto.	171,874	2,800	9,000	20·0	Humphrys	Apr. 1887	1889	Chatham.
Medusa	Ditto	ditto.	171,099	2,800	9,000	20·0	Ditto.	Apr. 1887	1889	Ditto.
Modified Medea, No. 1.	Ditto	ditto.	..	3,400	9,000	20·0	..	Apr. 1889	1891	Ditto.
Modified Medea, No. 2.	Ditto	ditto.	..	3,400	9,000	20·0	..	Apr. 1889	1891	Ditto.
Pallas	Ditto	ditto.	..	2,575	7,500	19·0	..	1889	1891	Portsmouth.
Phœbe	Ditto	ditto.	..	2,575	7,500	19·0	..	1889	1891	Devonport.
Philomel	Ditto	ditto.	..	2,575	7,500	19·0	..	1889	1891	Ditto.
Pearl	Ditto	ditto.	..	2,575	7,500	19·0	..	1889	1891	Pembroke.
Barham	Protected 3rd Class Cruiser.		101,408	1,830	6,000	19·5	Hawthorne	Oct. 1888	1890	Portsmouth.
Barrosa	Ditto	ditto.	91,557	1,580	3,000	16·5	Palmer	May 1888	1889	Ditto.
Barracouta	Ditto	ditto.	96,937	1,580	3,000	16·5	Ditto.	1888	1890	Sheerness.
Blanche	Ditto	ditto.	90,862	1,580	3,000	16·5	Earle	May 1888	1890	Pembroke, completed at Devonport.
Blonde	Ditto	ditto.	90,676	1,580	3,000	16·5	Ditto.	May 1888	1890	Ditto.
Racoon	Unprotected 3rd Class Cruiser.		120,506	1,770	4,500	17·5 to 18·0	Harland	Feb. 1886	1888	Devonport.
Serpent	Ditto	ditto.	121,050	1,770	4,500	17·5 to 18·0	Ditto.	1885	1888	Ditto.
Beagle	Unprotected Sloop		67,632	1,170	2,000	14·5	Rennie	May 1888	1889	Portsmouth.

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SHIPS BUILDING or COMPLETING in HER MAJESTY'S DOCKYARDS for which MONEY has been taken in the NAVY ESTIMATES for 1889–90—*continued.*

Ships' Name.	Class of Ship.	Total Cost, including Armament.	Load Displacement.	Indicated Horse-power.	Speed.	Manufacturer of Engines.	Date.		Where Built.
							Laid Down.	For Completion.	
		£							
Nymphe . .	Unprotected sloop . .	71,984	1,140	2,000	14·5	Greenock Foundry.	July 1887	1889	Portsmouth.
Daphne . .	Ditto.	73,404	1,140	2,000	14·5	Ditto.	June 1887	1889	Sheerness.
Basilisk . .	Ditto.	72,565	1,170	2,000	14·5	Rennie . .	May 1888	1889	Ditto.
Buzzard . .	Ditto.	85,214	1,140	2,000	14·5	Barrow . .	May 1886	1888	Ditto.
Melita . .	Ditto.	80,729	970	1,200	12·5	Malta . .	July 1883	1889	Malta.
Magpie . .	Unprotected 1st Class Gun-boat.	45,678	805	1,200	13·0	Earle. . .	Dec. 1887	1889	Pembroke, completed at Devonport.
Redbreast . .	Ditto ditto.	45,630	805	1,200	13·0	Ditto.	Jan. 1888	1889	Ditto.
Redpole . .	Ditto ditto.	45,575	805	1,200	13·0	Ditto.	Jan. 1888	1889	Ditto.
Lapwing . .	Ditto ditto.	50,635	805	1,200	13·0	Devonport .	May 1888	1889	Devonport.
Ringdove . .	Ditto ditto.	50,560	805	1,200	13·0	Ditto.	June 1888	1889	Ditto.
Goldfinch . .	Ditto ditto.	49,060	805	1,200	13·0	Sheerness .	Aug. 1888	1889	Sheerness.
Widgeon . .	Ditto ditto.	45,964	805	1,200	13·0	Rennie . .	May 1888	1889	Pembroke.
Peacock . .	Ditto ditto.	45,552	755	1,200	13·25	Barrow . .	May 1887	1888	Pembroke, completed at Devonport.
Pheasant . .	Ditto ditto.	50,121	755	1,200	13·25	Devonport .	June 1887	1888	Devonport.
Partridge . .	Ditto ditto.	50,121	755	1,200	13·25	Ditto.	June 1887	1888	Ditto.
Pigeon . .	Ditto ditto.	45,528	755	1,200	13·25	Barrow . .	May 1887	1889	Pembroke, completed at Devonport.
Plover . .	Ditto ditto.	45,345	755	1,200	13·25	Ditto.	May 1887	1889	Ditto.

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Pigmy . .	Ditto ditto.	48,773	755	1,200	13·25	Barrow . .	Sept. 1887	1889	Sheerness.
Salamander .	Unprotected Torpedo Gunboat.	56,374	735	4,500	21·0	Maudslay .	Apr. 1888	1889	Chatham.
Seagull . .	Ditto ditto.	56,375	735	4,500	21·0	Ditto.	Apr. 1888	1889	Ditto.
Sheldrake . .	Ditto ditto.	56,228	735	4,500	21·0	Ditto.	July 1888	1889	Ditto.
Skipjack . .	Ditto ditto.	57,282	735	4,500	21·0	Laird . .	July 1888	1889	Ditto.
Sharpshooter .	Ditto ditto.	56,955	735	4,500	21·0	Bellis . .	Sept. 1887	1889	Devonport.
Spanker . . .	Ditto ditto.	57,031	735	4,500	21·0	Ditto.	Apr. 1888	1889	Ditto.
Speedwell . .	Ditto ditto.	58,427	735	4,500	21·0	Laird . .	Apr. 1888	1889	Ditto.
Gossamer . .	Ditto ditto.	59,585	735	4,500	21·0	Sheerness .	Jan. 1889	1890	Sheerness.
Gleaner . .	Ditto ditto.	59,591	735	4,500	21·0	Maudslay .	Jan. 1889	1890	Ditto.
Spider . .	Ditto ditto.	48,189	525	2,000	19·0	Ditto.	June 1886	1889	Devonport.
Sandfly . .	Ditto ditto.	47,927	525	3,000	19·0	Ditto.	June 1886	1889	Ditto.
Grasshopper .	Ditto ditto.	47,750	525	3,000	19·0	Ditto.	Apr. 1886	1888	Sheerness.
Sharpshooter, No. 1.	Ditto ditto.	..	..	..	..	..	1889	..	Ditto.
Sharpshooter, No. 2.	Ditto ditto.	..	..	..	..	..	1889	..	Ditto.
Sharpshooter, No. 3.	Ditto ditto.	..	..	..	..	..	1889	..	Ditto.
Sharpshooter, No. 4.	Ditto ditto.	..	..	..	..	..	1889	..	Devonport.
Research . .	Unprotected Surveying Vessel	30,883	520	470	10·5	Barrow . .	Sept. 1887	1888	Chatham.
Mayflower . .	Training Brig . . .	21,262	508	..	..	..	Oct. 1888	1889	Pembroke, completed at Devonport.
Nos. 62 to 66 .	Coaling Lighters . .	4,389	..	..	..	..	..	..	Malta.
No. 5 . .	Iron Lighter . . .	2,050	..	..	..	..	..	..	Ditto.
One . . .	Steam Pinnace . . .	794	..	..	..	Malta . .	..	..	Ditto.

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SHIPS BUILDING or COMPLETING by CONTRACT for which MONEY has been taken in the NAVY ESTIMATES for 1889–90.

Name of Ship.	Class of Ship.	Total Cost, including Armament.	Load Displacement.	Indicated Horse-power.	Speed.	Manufacturer of Engines.	Date.		Where Built.
							Laid Down.	For Completion.	
		£							
Victoria	Armoured 1st Class Battle Ship.	844,922	10,470	14,000	17·0	Humphrys	..	1889	Elswick, completed at Chatham.
Sanspareil	Ditto ditto.	840,168	10,470	14,000	17·0	Ditto.	..	1889	Thames Iron Works, completed at Chatham.
Benbow	Ditto ditto.	830,683	10,600	11,500	16·75	Maudslay	Nov. 1882	1888	Ditto ditto.
Galatea	Armoured 1st Class Cruiser	291,803	5,600	8,500	18·5	Napier	Apr. 1886	1888	Glasgow, completed at Portsmouth.
Australia	Ditto ditto.	299,027	5,600	8,500	18·5	Ditto.	Apr. 1885	1888	Glasgow, completed at Chatham.
Narcissus	Ditto ditto.	300,149	5,600	8,500	18·5	Earle	Apr. 1885	1888–9	Hull, completed at Chatham.
Orlando	Ditto ditto.	303,065	5,600	8,500	18·5	Palmer	Apr. 1885	1888	Jarrow, completed at Devonport.
Undaunted	Ditto ditto.	300,863	5,600	8,500	18·5	Ditto.	Apr. 1885	1888	Ditto ditto.
Blenheim	Protected 1st Class Cruiser	..	9,000	20,000	22·0	..	..	..	Thames Iron Works.
Magicienne	Protected 2nd Class Cruiser	149·801	2,950	9,000	19·75	Hawthorn	Aug. 1887	1889	Glasgow, completed at Portsmouth.
Marathon	Ditto ditto.	149,972	2,950	9,000	19·75	Ditto.	Aug. 1887	1889	Ditto ditto.
Bellona	Protected 3rd Class Cruiser	93,607	1,830	6,000	19·5	Ditto.	..	..	Newcastle.
Brisk	Unprotected 3rd Class Cruiser	100,577	1,770	3,500	17·0	Thomson	Mar. 1885	1888	Glasgow, completed at Devonport.

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Cossack . .	Ditto ditto.	99,027	1,770	8,500	17·0	Ditto.	Mar. 1885	1888	Glasgow, completed at Portsmouth.
Tartar . .	Ditto ditto.	100,952	1,770	8,500	17·0	Ditto.	Mar. 1885	1888	Glasgow, completed at Sheerness.
Sparrow . .	Unprotected 1st Class Gunboat.	43,642	805	1,200	13·0	Greenock Foundry.	..	1889	Greenock Foundry Co., completed at Sheerness.
Thrush . .	Ditto ditto.	43,642	805	1,200	13·0	Ditto.	..	1889	Ditto ditto.
Traveller . .	Unprotected Special Service Vessel.	26,467	700	1,120	12·1	Howden & Co.	Purchased.		Paisley.
Hawk . .	Unprotected Tender Coastguard.	11,436	416	430	11·1	Penn . .	Purchased.		Cowes.
Six, Nos. 82 to 87	1st Class Torpedo Boats .	66,365 without Armament.	..	..	..	Yarrow . .	..	..	Poplar.
Ten, Nos. 39 to 48	2nd Class Torpedo Boats .	30,829 without Armament.	..	..	..	Ditto.	..	..	Ditto.
Nos. 51 and 62 .	Steam Coaling and Tug Vessels.	9,279	..	..	..	Hawthorn .	..	..	Newcastle.
Nos. 52 to 61 and 63 to 72 . .	Coaling Barges . . .	27,940	..	..	..	..	..	..	Chepstow.
Nos. 73 and 74 .	Steam Coaling Barges for Portsmouth . . .	9,995	..	..	..	Hawthorn .	..	..	Newcastle.
Nos. 35 and 36 .	Steam Coaling Barge for Devonport . . .	9,995	..	..	..	Ditto.	..	..	Ditto.
	Steam Coaling Barge for Pembroke . . .	4,986 estimated.	..	..	..	Not ordered .	..	..	Not ordered.
Two in No. .	Coaling Lighters for Pembroke.	6,646	..	..	..	Ditto.	..	..	Ditto.
Steam boats .	Steamboats . . .	28,253	..	..	..	..	..	..	....
Sundries . .	.. ..	32,346	..	..	..	..	..	..	....

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List of New Ships and Vessels Estimated to be passed into the First Reserve during the Years 1889–90 and 1888–89.

1889–90.					1888–89.				
Name of Ship.		Load Displacement in Tons.	Indicated Horse Power.	Number of Guns.	Name of Ship.		Load Displacement in Tons.	Indicated Horse Power.	Number of Guns.
ARMOURED SHIPS:					**ARMOURED SHIPS:**				
Trafalgar	Battle Ships, First Class.	11,940	12,000	10	Anson	Battle Ships, First Class.	10,600	11,500	10
Victoria		10,470	14,000	15	Howe (*a*)		10,300	11,500	10
Sans Pareil		10,470	14,000	15	Australia (*a*)	Cruisers, First Class.	5,600	8,500	12
Camperdown		10,600	11,500	10	Galatea (*a*)		5,600	8,500	12
PROTECTED SHIPS:					Narcissus (*a*)		5,600	8,500	12
Magicienne	Cruisers, Second Class.	2,950	9,000	6	Immortalite		5,600	8,500	12
Marathon		2,950	9,000	6	Aurora (*a*)		5,600	8,500	12
Melpomene		2,950	9,000	6	Undaunted		5,600	8,500	12
Bellona	Cruisers, Third Class.	1,830	6,000	6	**PROTECTED SHIPS:**				
Barham		1,830	6,000	6					
Barracouta		1,580	3,000	6	Forth	Cruisers, Second Class.	4,050	5,700	12
Barrosa		1,580	3,000	6	Thames		4,050	5,700	12
Blanche		1,580	3,000	6	Medea		2,800	9,000	6
Blonde		1,580	3,000	6	Medusa		2,800	9,000	6
UNPROTECTED SHIPS:					**UNPROTECTED SHIPS:**				
Basilisk	Sloops.	1,170	2,000	8					
Beagle		1,170	2,000	8	Racoon	Cruisers, Third Class.	1,770	4,500	6
Sharpshooter	Torpedo Gunboats, First Class.	735	4,500	2	Serpent		1,770	4,500	6
Gossamer		735	4,500	2	Brisk		1,770	3,500	6
Salamander		735	4,500	2	Cossack		1,770	3,500	6
Seagull		735	4,500	2	Tartar		1,770	3,500	6
Sheldrake		735	4,500	2	Daphne	Sloops.	1,140	2,000	8
Skipjack		735	4,500	2	Melita		970	1,200	8
Spanker		735	4,500	2	Nymphe		1,140	2,000	8
Speedwell		735	4,500	2	Grasshopper	Torpedo Gunboats, First Class.	525	3,000	1
Goldfinch	Gunboats, First Class.	805	1,200	6	Sandfly		525	3,000	1
Lapwing		805	1,200	6	Spider		525	3,000	1
Magpie		805	1,200	6	Partridge	Gunboats, First Class.	755	1,200	6
Redbreast		805	1,200	6	Peacock		755	1,200	6
Redpole		805	1,200	6	Pigeon		755	1,200	6
Ringdove		805	1,200	6	Pigmy		755	1,200	6
Widgeon		805	1,200	6	Pheasant		755	1,200	6
Sparrow		805	1,200	6	Plover		755	1,200	6
Thrush		805	1,200	6					
Mayflower	Sailing Brig.	508	..	..	*Research*	Surveying Vessel.	520	450	1

(*a*) Complete, except guns not delivered during the year.

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A List of the Armoured and Unarmoured Fighting Ships of England laid down to Build since April, 1880.

Rate.	Name.	When Laid Down.
1880.		
Armour-plated Steel Barbette Ship	Collingwood.	12 July
Steam Cruiser .	Leander .	14 June
„ „	Phaeton .	14 June
„ „	Arethusa .	14 June
Composite Sloop .	Satellite * .	4 Oct.
„ „	Heroine * .	30 Aug.
„ „	Hyacinth * .	30 Aug.
Composite Gunboat	Starling .	19 Aug.
„ „	Stork . .	19 Aug.
„ „	Raven . .	19 Aug.
1881.		
Armour-plated Steel Barbette Ship	Impérieuse .	10 Aug.
Armour-plated Steel Barbette Ship .	Warspite .	25 Oct.
Steam Cruiser .	Amphion .	25 April
Corvette (Steel and Iron) . . .	Calliope .	1 Oct.
Corvette (Steel and Iron) . . .	Calypso .	1 Sept.
Composite Sloop .	Rapid * .	21 April
„ „	Royalist * .	27 April
„ „	Caroline * .	24 Oct.
Composite Gunboat	Albacore .	2 Sept.
„ „	Mistletoe .	2 Sept.
„ „	Watchful .	2 Sept.
Composite Gun Vessel . .	Dolphin † .	10 Oct.
Composite Gun Vessel . .	Wanderer † .	10 Oct.
1881—*continued*.		
Composite Steam Vessel . .	Alecto . .	16 Jan.
Composite Steam Vessel . . .	Sphinx .	26 Aug.
1882.		
Armour-plated Steel Barbette Ship .	Camperdown	18 Dec.
Armour-plated Steel Barbette Ship .	Benbow .	1 Nov.
Armour-plated Steel Barbette Ship .	Howe . .	7 June
Armour-plated Steel Barbette Ship .	Rodney .	6 Feb.
Composite Gun Vessel . .	Acorn . .	16 Oct.
1883.		
Armour-plated Steel Barbette Ship .	Anson . .	24 April
Steam Cruiser (Steel)	Mersey .	9 July
Composite Sloop .	Pylades * .	1 Jan.
Composite Gun Vessel . .	Mariner .	8 Jan.
Composite Gun Vessel . .	Reindeer .	15 Jan.
Composite Gun Vessel . .	Racer . .	9 April
Composite Gun Vessel . .	Melita . .	18 July
1884.		
Armour-plated Steel Turret Ship and Ram . . .	Hero . .	21 April
Steam Cruiser (Steel)	Severn .	1 Jan.
„ „	Thames .	14 April
„ „	Forth .	1 Dec.

* Re-classified as a corvette by A. O., 28 July, 1883.

† Re-classified as a sloop by A. O., 27 May, 1884.

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LIST of NEW SHIPS and VESSELS Estimated to be passed into the FIRST RESERVE during the Years 1889–90 and 1888–89.

1889–90.					1888–89.				
NAME OF SHIP.		Load Displacement in Tons.	Indicated Horse Power.	Number of Guns.	NAME OF SHIP.		Load Displacement in Tons.	Indicated Horse Power.	Number of Guns.
ARMOURED SHIPS:					**ARMOURED SHIPS:**				
Trafalgar	Battle Ships, First Class.	11,940	12,000	10	Anson	Battle Ships, First Class.	10,600	11,500	10
Victoria		10,470	14,000	15	Howe (*a*)		10,300	11,500	10
Sans Pareil		10,470	14,000	15	Australia (*a*)	Cruisers, First Class.	5,600	8,500	12
Camperdown		10,600	11,500	10	Galatea (*a*)		5,600	8,500	12
PROTECTED SHIPS:					Narcissus (*a*)		5,600	8,500	12
Magicienne	Cruisers, Second Class.	2,950	9,000	6	Immortalite		5,600	8,500	12
Marathon		2,950	9,000	6	Aurora (*a*)		5,600	8,500	12
Melpomene		2,950	9,000	6	Undaunted		5,600	8,500	12
Bellona	Cruisers, Third Class.	1,830	6,000	6	**PROTECTED SHIPS:**				
Barham		1,830	6,000	6					
Barracouta		1,580	3,000	6	Forth	Cruisers, Second Class.	4,050	5,700	12
Barrosa		1,580	3,000	6	Thames		4,050	5,700	12
Blanche		1,580	3,000	6	Medea		2,800	9,000	6
Blonde		1,580	3,000	6	Medusa		2,800	9,000	6
UNPROTECTED SHIPS:					**UNPROTECTED SHIPS:**				
Basilisk	Sloops.	1,170	2,000	8					
Beagle		1,170	2,000	8	Racoon	Cruisers, Third Class.	1,770	4,500	6
Sharpshooter	Torpedo Gunboats, First Class.	735	4,500	2	Serpent		1,770	4,500	6
Gossamer		735	4,500	2	Brisk		1,770	3,500	6
Salamander		735	4,500	2	Cossack		1,770	3,500	6
Seagull		735	4,500	2	Tartar		1,770	3,500	6
Sheldrake		735	4,500	2	Daphne	Sloops.	1,140	2,000	8
Skipjack		735	4,500	2	Melita		970	1,200	8
Spanker		735	4,500	2	Nymphe		1,140	2,000	8
Speedwell		735	4,500	2	Grasshopper	Torpedo Gunboats, First Class.	525	3,000	1
Goldfinch	Gunboats, First Class.	805	1,200	6	Sandfly		525	3,000	1
Lapwing		805	1,200	6	Spider		525	3,000	1
Magpie		805	1,200	6	Partridge	Gunboats, First Class.	755	1,200	6
Redbreast		805	1,200	6	Peacock		755	1,200	6
Redpole		805	1,200	6	Pigeon		755	1,200	6
Ringdove		805	1,200	6	Pigmy		755	1,200	6
Widgeon		805	1,200	6	Pheasant		755	1,200	6
Sparrow		805	1,200	6	Plover		755	1,200	6
Thrush		805	1,200	6	*Research*	Surveying Vessel.	520	450	1
Mayflower	Sailing Brig.	508	..	..					

(*a*) Complete, except guns not delivered during the year.

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A List of the Armoured and Unarmoured Fighting Ships of England laid down to Build since April, 1880.

Rate.	Name.	When Laid Down.
	1880.	
Armour-plated Steel Barbette Ship	Collingwood.	12 July
Steam Cruiser .	Leander .	14 June
„ „	Phaeton .	14 June
„ „	Arethusa .	14 June
Composite Sloop .	Satellite * .	4 Oct.
„ „	Heroine * .	30 Aug.
„ „	Hyacinth * .	30 Aug.
Composite Gunboat	Starling .	19 Aug.
„ „	Stork . .	19 Aug.
„ „	Raven . .	19 Aug.
	1881.	
Armour-plated Steel Barbette Ship	Impérieuse .	10 Aug.
Armour-plated Steel Barbette Ship .	Warspite .	25 Oct.
Steam Cruiser .	Amphion .	25 April
Corvette (Steel and Iron) . . .	Calliope .	1 Oct.
Corvette (Steel and Iron) . . .	Calypso .	1 Sept.
Composite Sloop .	Rapid * .	21 April
„ „	Royalist * .	27 April
„ „	Caroline * .	24 Oct.
Composite Gunboat	Albacore .	2 Sept.
„ „	Mistletoe .	2 Sept.
„ „	Watchful .	2 Sept.
Composite Gun Vessel . .	Dolphin † .	10 Oct.
Composite Gun Vessel . .	Wanderer † .	10 Oct.
	1881—*continued*.	
Composite Steam Vessel . .	Alecto . .	16 Jan.
Composite Steam Vessel . . .	Sphinx .	26 Aug.
	1882.	
Armour-plated Steel Barbette Ship .	Camperdown	18 Dec.
Armour-plated Steel Barbette Ship .	Benbow .	1 Nov.
Armour-plated Steel Barbette Ship .	Howe . .	7 June
Armour-plated Steel Barbette Ship .	Rodney .	6 Feb.
Composite Gun Vessel . .	Acorn . .	16 Oct.
	1883.	
Armour-plated Steel Barbette Ship .	Anson . .	24 April
Steam Cruiser (Steel)	Mersey .	9 July
Composite Sloop .	Pylades * .	1 Jan.
Composite Gun Vessel . .	Mariner .	8 Jan.
Composite Gun Vessel . .	Reindeer .	15 Jan.
Composite Gun Vessel . .	Racer . .	9 April
Composite Gun Vessel . .	Melita . .	18 July
	1884.	
Armour-plated Steel Turret Ship and Ram . . .	Hero . .	21 April
Steam Cruiser (Steel)	Severn .	1 Jan.
„ „	Thames .	14 April
„ „	Forth .	1 Dec.

* Re-classified as a corvette by A. O., 28 July, 1883.

† Re-classified as a sloop by A. O., 27 May, 1884.

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List of New Ships and Vessels Estimated to be passed into the First Reserve during the Years 1889–90 and 1888–89.

1889–90.					1888–89.				
Name of Ship.		Load Displacement in Tons.	Indicated Horse Power.	Number of Guns.	Name of Ship.		Load Displacement in Tons.	Indicated Horse Power.	Number of Guns.
ARMOURED SHIPS:					**ARMOURED SHIPS:**				
Trafalgar	Battle Ships, First Class.	11,940	12,000	10	Anson	Battle Ships, First Class.	10,600	11,500	10
Victoria		10,470	14,000	15	Howe (*a*)		10,300	11,500	10
Sans Pareil		10,470	14,000	15	Australia (*a*)	Cruisers, First Class.	5,600	8,500	12
Camperdown		10,600	11,500	10	Galatea (*a*)		5,600	8,500	12
PROTECTED SHIPS:					Narcissus (*a*)		5,600	8,500	12
Magicienne	Cruisers, Second Class.	2,950	9,000	6	Immortalite		5,600	8,500	12
Marathon		2,950	9,000	6	Aurora (*a*)		5,600	8,500	12
Melpomene		2,950	9,000	6	Undaunted		5,600	8,500	12
Bellona	Cruisers, Third Class.	1,830	6,000	6					
Barham		1,830	6,000	6	**PROTECTED SHIPS:**				
Barracouta		1,580	3,000	6	Forth	Cruisers, Second Class.	4,050	5,700	12
Barrosa		1,580	3,000	6	Thames		4,050	5,700	12
Blanche		1,580	3,000	6	Medea		2,800	9,000	6
Blonde		1,580	3,000	6	Medusa		2,800	9,000	6
UNPROTECTED SHIPS:					**UNPROTECTED SHIPS:**				
Basilisk	Sloops.	1,170	2,000	8					
Beagle		1,170	2,000	8	Racoon	Cruisers, Third Class.	1,770	4,500	6
Sharpshooter	Torpedo Gunboats, First Class.	735	4,500	2	Serpent		1,770	4,500	6
Gossamer		735	4,500	2	Brisk		1,770	3,500	6
Salamander		735	4,500	2	Cossack		1,770	3,500	6
Seagull		735	4,500	2	Tartar		1,770	3,500	6
Sheldrake		735	4,500	2	Daphne	Sloops.	1,140	2,000	8
Skipjack		735	4,500	2	Melita		970	1,200	8
Spanker		735	4,500	2	Nymphe		1,140	2,000	8
Speedwell		735	4,500	2	Grasshopper	Torpedo Gunboats, First Class.	525	3,000	1
Goldfinch	Gunboats, First Class.	805	1,200	6	Sandfly		525	3,000	1
Lapwing		805	1,200	6	Spider		525	3,000	1
Magpie		805	1,200	6	Partridge	Gunboats, First Class.	755	1,200	6
Redbreast		805	1,200	6	Peacock		755	1,200	6
Redpole		805	1,200	6	Pigeon		755	1,200	6
Ringdove		805	1,200	6	Pigmy		755	1,200	6
Widgeon		805	1,200	6	Pheasant		755	1,200	6
Sparrow		805	1,200	6	Plover		755	1,200	6
Thrush		805	1,200	6	*Research*	Surveying Vessel.	520	450	1
Mayflower	Sailing Brig.	508	..	..					

(*a*) Complete, except guns not delivered during the year.

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A List of the Armoured and Unarmoured Fighting Ships of England laid down to Build since April, 1880.

Rate.	Name.	When Laid Down.
1880.		
Armour-plated Steel Barbette Ship	Collingwood.	12 July
Steam Cruiser .	Leander .	14 June
„ „	Phaeton .	14 June
„ „	Arethusa .	14 June
Composite Sloop .	Satellite * .	4 Oct.
„ „	Heroine * .	30 Aug.
„ „	Hyacinth * .	30 Aug.
Composite Gunboat	Starling .	19 Aug.
„ „	Stork . .	19 Aug.
„ „	Raven . .	19 Aug.
1881.		
Armour-plated Steel Barbette Ship	Impérieuse .	10 Aug.
Armour-plated Steel Barbette Ship .	Warspite .	25 Oct.
Steam Cruiser .	Amphion .	25 April
Corvette (Steel and Iron) . . .	Calliope .	1 Oct.
Corvette (Steel and Iron) . . .	Calypso .	1 Sept.
Composite Sloop .	Rapid * .	21 April
„ „	Royalist * .	27 April
„ „	Caroline * .	24 Oct.
Composite Gunboat	Albacore .	2 Sept.
„ „	Mistletoe .	2 Sept.
„ „	Watchful .	2 Sept.
Composite Gun Vessel . .	Dolphin † .	10 Oct.
Composite Gun Vessel . .	Wanderer † .	10 Oct.
1881—*continued*.		
Composite Steam Vessel . .	Alecto . .	16 Jan.
Composite Steam Vessel . . .	Sphinx .	26 Aug.
1882.		
Armour-plated Steel Barbette Ship .	Camperdown	18 Dec.
Armour-plated Steel Barbette Ship .	Benbow .	1 Nov.
Armour-plated Steel Barbette Ship .	Howe . .	7 June
Armour-plated Steel Barbette Ship .	Rodney .	6 Feb.
Composite Gun Vessel . .	Acorn . .	16 Oct.
1883.		
Armour-plated Steel Barbette Ship .	Anson . .	24 April
Steam Cruiser (Steel)	Mersey .	9 July
Composite Sloop .	Pylades * .	1 Jan.
Composite Gun Vessel . .	Mariner .	8 Jan.
Composite Gun Vessel . .	Reindeer .	15 Jan.
Composite Gun Vessel . .	Racer . .	9 April
Composite Gun Vessel . .	Melita . .	18 July
1884.		
Armour-plated Steel Turret Ship and Ram . . .	Hero . .	21 April
Steam Cruiser (Steel)	Severn .	1 Jan.
„ „	Thames .	14 April
„ „	Forth .	1 Dec.

* Re-classified as a corvette by A. O., 28 July, 1883.

† Re-classified as a sloop by A. O., 27 May, 1884.

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A List of the Armoured and Unarmoured Fighting Ships of England Laid Down to Build since April, 1880—*continued.*

Rate.	Name.	When Laid Down.
1885.		
Torpedo Cruiser (Steel)	Scout	8 Jan.
Armed Despatch Vessel	Alacrity *	14 Feb.
Armed Despatch Vessel	Surprise *	14 Feb.
Armed Despatch Vessel	Fearless	22 Sept.
Composite Gun Vessel	Icarus	18 Aug.
Composite Gun Vessel	Swallow	1 Jan.
Gun and Torpedo Vessel (Steel)	Curlew	5 Jan.
Gun and Torpedo Vessel (Steel)	Landrail	5 Jan.
Armoured Turret Ship	Renown	23 April
Armoured Turret Ship	Sans Pareil	21 April
Torpedo Cruiser	Archer	2 March
„ „	Brisk	2 March
„ „	Cossack	2 March
„ „	Mohawk	2 March
„ „	Porpoise	2 March
„ „	Serpent	9 Nov.
„ „	Tartar	2 March
Armour - Belted Cruiser	Australia	21 April
Armour - Belted Cruiser	Galatea	21 April
Armour - Belted Cruiser	Narcissus	27 April
Armour - Belted Cruiser	Orlando	23 April
Armour - Belted Cruiser	Undaunted	23 April
Composite Gunboat	Bramble	25 Aug.
1885—*continued.*		
Composite Gunboat	Lizard	25 Aug.
„ „	Rattler	17 Aug.
„ „	Wasp	17 Aug.
Torpedo Gunboat	Rattlesnake	— Nov.
1886.		
Torpedo Cruiser	Racoon	1 Feb.
Armour-Belted Cruiser	Immortalité	18 Jan.
Armour-Belted Cruiser	Aurora	1 Feb.
Ironclad Turret	Trafalgar	18 Jan.
„ „	Nile	8 April
Torpedo Gunboat	Sandfly	19 April
„ „	Sharpshooter	— Sept.
„ „	Grasshopper	27 April
„ „	Spider	7 June
Composite Sloop	Buzzard	1 May
1887.		
Cruiser, 2nd class	Medea	April
„ „	Medusa	April
„ „	Magicienne	Aug.
„ „	Marathon	Aug.
„ „	Melpomène	Oct.
Sloop	Daphne	June
„	Nymphe	July
Gunboat	Peacock	May
„	Pigeon	May
„	Plover	May
„	Pheasant	June
„	Partridge	June
„	Pigmy	Sept.
„	Magpie	Dec.
Surveying Vessel	Research	Sept.

* Alacrity and Surprise were not intended to be fighting ships when first laid down, but armaments were ordered for them in January, 1886.

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A List of the Armoured and Unarmoured Fighting Ships in England Laid Down to Build since April, 1880—*continued.*

Rate.	Name.	When Laid Down.
	1888.	
Cruisers, 1st class, Protected	Blake	July
" "	Blenheim	July
Protected Torpedo Depôt Ship	Vulcan	June
Cruiser, 3rd class, Protected	Barham	Oct.
" "	Barrosa	May
" "	Barracouta	—
" "	Blanche	May
" "	Blonde	May
" "	Bellona	—
Sloop, Unprotected	Beagle	May
" "	Basiliak	May
Torpedo Gunboat	Salamander	April
" "	Seagull	April
Torpedo Gunboat	Sheldrake	July
" "	Skipjack	April
" "	Spanker	April
" "	Speedwell	April
Gunboat, 1st class	Sparrow	—
" "	Thrush	—
" "	Redbreast	Jan.
" "	Redpole	Jan.
" "	Lapwing	May
" "	Ringdove	June
" "	Goldfinch	Aug.
" "	Widgeon	May
" "	Plover	—
	1888—*continued.*	

For Ships and Vessels to be laid down in accordance with the New Programme, see p. 156.

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STATEMENT showing the COST of the different CLASSES of in each Year to the FLEET, and the

YEAR OF COMPLETION.	Armoured, Protected, and Partially Protected. Depreciation, 4 per cent. per annum for 22 years from date of Completion.	Corvettes, Sloops, Torpedo Cruisers, Gun Vessels, Gunboats, Troop Ships, &c. Depreciation, 6 per cent. per annum for 15 years from date of Completion.
	£	£
First Cost of Ships not included for Depreciation in following Tables	3,631,791	4,587,549
First Cost of Ships completed in 1867-68 . .	610,544	..
" " 1868-69 . .	1,739,239	..
" " 1869-70 . .	478,971	..
" " 1870-71 . .	782,386	..
" " 1871-72 . .	939,092	..
" " 1872-73 . .	273,169	..
" " 1873-74 . .	847,405	..
" " 1874-75 . .	300,767	582,112
" " 1875-76 . .	..	784,488
" " 1876-77 . .	802,030	411,785
" " 1877-78 . .	1,699,854	1,069,160
" " 1878-79 . .	1,134,012	1,286,036
" " 1879-80 . .	809,139	674,575
" " 1880-81 . .	684,102	363,215
" " 1881-82 . .	2,370,225	284,220
" " 1882-83 . .	755,247	175,555
" " 1883-84 . .	251,322	461,852
" " 1884-85 . .	725,919	374,122
" " 1885-86 . .	2,884,409	..
" " 1886-87 . .	2,746,298	624,549
" " 1887-88 . .	6,221,044	1,326,788
" " 1888-89 (*a*) .	1,883,625	559,666
TOTAL	28,938,799	8,978,123
Add,—Cost of Vessels lost, sold, or broken up, built within above period	1,413,246	824,296
Add,—Estimated Cost of Vessels included in Lord Northbrook's Programme, not completed on 1st April, 1889 . . .	1,544,781	..
TOTAL	31,896,826	9,802,419
Estimated Annual Percentage for Depreciation	4 per cent.	6 per cent.
Annual Amount required for Replacement . .	£1,275,873	£588,145

(*a*) Revised estimated cost.

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VESSELS (including Proportion of INCIDENTAL CHARGES) added Estimated Annual RATE of DEPRECIATION.

Torpedo Boats, Steam Launches, &c. Depreciation, 9 per cent. per annum for 11 years from date of Completion.	Guard, Receiving, Training, and Harbour Vessels. Depreciation, 4 per cent. per annum for 22 years from date of Completion.	Small Vessels, Tugs, and Yard Craft. Depreciation, 5 per cent. per annum for 18 years from date of Completion.	TOTAL.
£	£	£	£
200,000 (Estimated.)	4,480,762	328,504	13,228,606
..	..	..	610,544
..	23,753	..	1,762,992
..	..	..	478,971
..	..	..	782,386
..	33,371	..	972,463
..	22,722	..	295,891
..	..	40,547	887,952
..	..	8,338	891,217
..	..	60,862	845,350
..	..	..	1,213,815
..	..	29,262	2,798,276
1,745,700 (Estimated.)	..	..	28,583,163
	54,036	..	
	..	4,368	
	..	9,830	
	..	23,920	
	..	71,512	
	..	..	
	..	7,280	
	..	12,869	
	..	6,716	
	..	51,012	
1,745,700	133,882	326,516	40,123,020
53,285	158,915	60,411	2,510,153
..	..	..	1,544,781
1,798,985	292,797	386,927	44,177,954
9 per cent.	4 per cent.	5 per cent.	..
£161,909	£11,712	£19,346	£2,056,985

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STATEMENT showing the COST of the different CLASSES of in each Year to the FLEET, and the

YEAR OF COMPLETION.	Armoured, Protected, and Partially Protected. Depreciation, 4 per cent. per annum for 22 years from date of Completion.	Corvettes, Sloops, Torpedo Cruisers, Gun Vessels, Gunboats, Troop Ships, &c. Depreciation, 6 per cent. per annum for 15 years from date of Completion.
	£	£
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First Cost of Ships completed in 1867-68 . .	610,544	..
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" " 1871-72 . .	939,092	..
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" " 1874-75 . .	300,767	582,112
" " 1875-76 . .	..	784,488
" " 1876-77 . .	802,030	411,785
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" " 1879-80 . .	809,139	674,575
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" " 1881-82 . .	2,370,225	284,220
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" " 1883-84 . .	251,322	461,852
" " 1884-85 . .	725,919	374,122
" " 1885-86 . .	2,884,409	..
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" " 1887-88 . .	6,221,044	1,326,788
" " 1888-89 (*a*) .	1,883,625	559,666
TOTAL	28,938,799	8,978,123
Add,—Cost of Vessels lost, sold, or broken up, built within above period	1,413,246	824,296
Add,—Estimated Cost of Vessels included in Lord Northbrook's Programme, not completed on 1st April, 1889 . . .	1,544,781	..
TOTAL	31,896,826	9,802,419
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Annual Amount required for Replacement . .	£1,275,873	£588,145

(*a*) Revised estimated cost.

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VESSELS (including Proportion of INCIDENTAL CHARGES) added Estimated Annual RATE of DEPRECIATION.

Torpedo Boats, Steam Launches, &c. — Depreciation, 9 per cent. per annum for 11 years from date of Completion.	Guard, Receiving, Training, and Harbour Vessels. — Depreciation, 4 per cent. per annum for 22 years from date of Completion.	Small Vessels, Tugs, and Yard Craft. — Depreciation, 5 per cent. per annum for 18 years from date of Completion.	TOTAL.
£	£	£	£
200,000 (Estimated.)	4,480,762	328,504	13,228,606
..	..	..	610,544
..	23,753	..	1,762,992
..	..	..	478,971
..	..	..	782,386
..	33,371	..	972,463
..	22,722	..	295,891
..	..	40,547	887,952
..	..	8,338	891,217
..	..	60,862	845,350
..	..	..	1,213,815
..	..	29,262	2,798,276
	..	..	
	54,036	..	
	..	4,368	
	..	9,830	
	..	23,920	
1,745,700 (Estimated.)	..	71,512	28,583,163
	..	..	
	..	7,280	
	..	12,869	
	..	6,716	
	..	51,012	
1,745,700	133,882	326,516	40,123,020
53,285	158,915	60,411	2,510,153
..	..	..	1,544,781
1,798,985	292,797	386,927	44,177,954
9 per cent.	4 per cent.	5 per cent.	..
£161,909	£11,712	£19,346	£2,056,985

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STATEMENT showing the Approximate Aggregate COST of the Effective Royal Navy, under the years of their completion.

For Details See Statement. No.	CLASS OF SHIP.	Prior to 1867-68.	1867-8.	1868-9.	1869-70.	1870-1.	1871-2.	1872-3.	1873-4.	1874-5.	1875-6.	1876-7.	1877-8.	1878-9.
	1. EFFECTIVE SHIPS:													
	COMBATANT:	£	£	£	£	£	£	£	£	£	£	£	£	£
3	Armoured . .	1,699,297	531,817	1,356,691	371,415	714,257	773,873	267,718	771,253	239,197	..	682,626	1,461,069	886,918
		273,433	*15,787*	*134,899*	*107,556*	*68,129*	*165,219*	*5,451*	*76,152*	*61,570*		*119,404*	*238,785*	*119,024*
3	Protected . .	..	..	..	..	..	..	..	..	..	..	..	..	..
3	Partially protected	..	..	..	..	..	..	..	..	..	..	..	..	123,913
														4,157
	Unprotected, viz.:													
3	Frigates . . .	..	..	..	226,260	..	..	..	..	210,234	..	..	..	..
					57,580					*59,582*				
3	Corvettes . . .	..	..	..	132,817	132,102	..	..	..	..	453,526	103,429	444,079	209,712
					2,578	*2,852*					*41,668*	*3,886*	*48,422*	*43,871*
3	Sloops . . .	..	..	..	..	..	..	..	..	..	..	..	228,257	111,174
													32,022	*28,877*
3	Torpedo Depot Ship, and Cruisers .	..	..	..	..	..	..	..	..	..	..	..	..	126,517
														5,060
3	Torpedo Gunboats	..	..	..	..	..	..	..	..	..	..	..	..	..
3	Gun-Vessels . .	..	..	..	..	..	..	..	54,297	..	36,661	..	77,671	..
									12,548		*1,290*		*10,125*	
2	Gunboats . . .	..	..	..	..	..	..	31,655	15,888	..	..	..	71,074	48,961
								7,757	*3,550*				*2,288*	*1,721*
3	Gunboats, Coast Defence . . .	..	..	6,719	..	7,751	88,539	54,059	43,855	..	..	..	40,714	217,838
				33		*2,388*	*15,111*	*5,489*	*266*				*3,192*	*17,686*
3	Despatch, Surveying Vessels, &c.	245,072	40,480	..	..	..	..	..	..	171,434	..	..	..	..
		62,317	*10,474*							*40,619*				
..	Torpedo Boats, Launches, &c. .	..	..	..	..	..	..	..	..	..	..	..	..	..
	£	1,944,369	572,297	1,357,410	730,492	854,110	862,412	353,432	885,293	620,865	490,187	786,055	2,322,864	1,725,032
		335,750	*26,261*	*134,932*	*167,714*	*73,369*	*180,330*	*18,697*	*92,516*	*161,771*	*42,958*	*123,290*	*334,834*	*220,356*
	NON-COMBATANT:													
3	Troop and Store Ships . . .	382,114	..	..	..	..	..	..	21,500	..	101,625	..	..	123,679
		9,558									*2,507*			*2,157*
..	Small Steam Vessels, Tugs, Tanks, &c. . .	235,299	13,187	26,514	22,054	..	..	..	37,798	8,018	50,521	..	25,546	..
		25,066	*527*	*1,060*	*882*				*2,749*	*320*	*10,341*		*1,021*	
	2. NON-EFFECTIVE SHIPS:													
..	Ships capable of being fitted, but not ordered . .	688,561	..	196,789	..	75,993	..	..	..	43,806	..	249,974	39,977	288,256
		29,275		*56,860*		*21,851*				*11,358*		*54,496*	*1,433*	*61,158*
..	Ships unfit for Service, or ordered to be sold, &c. .	2,913,095	84,511	..	..	..	15,499	..	36,719	42,932	140,888	..	60,201	..
		746,136	*12,016*				*6,199*		*10,661*	*2,147*	*6,323*		*9,705*	
	3. GUARD, RECEIVING, &c., SHIPS:													
..	Guard, Receiving, &c., Ships . .	3,243,120	48,469	21,879	..	..	25,843	16,230	..	..	..	..	1,925	..
		1,167,126	*19,387*	*1,874*			*7,528*	*6,492*					*770*	
	4. SHIPS NOT COMPLETE:													
..	Armoured . .	..	..	..	..	..	..	..	..	..	..	..	..	..
..	Protected . .	..	..	..	..	..	..	..	..	..	..	..	..	..
..	Partially Protected	..	..	..	..	..	..	..	..	..	..	..	..	..
..	Unprotected . .	..	..	..	..	..	..	..	..	..	..	..	..	..
	TOTAL . £	9,406,558	718,464	1,602,592	752,546	930,103	903,754	369,662	981,310	715,621	783,221	1,036,029	2,450,513	2,136,367
		2,312,911	*58,191*	*194,726*	*168,596*	*95,220*	*194,057*	*25,189*	*105,926*	*175,596*	*62,129*	*177,786*	*347,763*	*283,651*

NOTE.—The Figures in *Italics* represent the dockyard incidental charges apportioned to each Ship.

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and Non-Effective SHIPS at present on the Strength of the
(Incidental Charges printed in *Italics*).

1879-80.	1880-1.	1881-2.	1882-3.	1883-4.	1884-5.	1885-6.	1886-7.	1887-8.	1888-9 (a).	TOTAL First Cost.	Expended to 31st of March, 1889, on Vessels not yet Complete.	Outstanding Liabilities on 1st of April, 1889 on Ships Commenced.
£	£	£	£	£	£	£	£	£	£	£	£	£
414,434	531,846	1,912,964	296,761	..	530,015	1,210,109	2,227,135	5,001,015	1,195,753		..	..
13,374	*24,816*	*179,368*	*4,696*		*104,527*	*206,566*	*319,255*	*470,796*	*137,477*			
..	..	..	226,305	..	..	..	..	641,121	488,831	27,176,714	..	..
			49,476					*108,112*	*61,564*	*3,418,226*		
368,177	122,681	246,059	140,453	204,775	73,644	1,279,454	191,138	..	..		..	..
13,154	*4,759*	*31,834*	*97,556*	*46,547*	*17,733*	*188,280*	*8,770*					
..	..	..	..	..	..	..	..	..	..	436,494	..	..
										117,162		
464,155	..	..	..	234,860	..	..	..	..	..		..	..
79,074				*34,446*								
..	52,867	105,363	..	53,871	264,010	..	180,246	64,509	174,671		..	..
	12,826	*27,036*		*13,824*	*41,658*		*30,205*	*16,045*	*32,126*			
..	..	..	..	..	..	..	96,462	788,397	..		..	..
							4,781	*66,292*				
..	..	..	..	..	..	..	..	151,822	48,355		..	..
								22,634	*6,808*	7,414,478		
..	156,801	..	..	..	..	..	114,033	..	..	*926,672*	..	..
	6,616						*25,365*					
..	23,653	67,857	92,761	32,783	65,584	..	..	142,522	226,389		..	..
	4,350	*2,910*	*7,796*	*1,263*	*2,870*			*3,423*	*40,469*			
47,500	..	23,478	..	..	..	..	..	..	..		..	..
9,072		*4,324*										
..	102,436	23,570	71,766	88,037	..	..	167,178	67,478	26,783		..	..
	3,666	*733*	*3,232*	*2,769*			*6,279*	*3,667*	*4,065*			
..	..	..	..	..	..	..	..	..	..	*1,945,700	..	..
1,294,266	990,284	2,379,291	828,046	614,326	933,253	2,489,563	2,976,192	6,856,864	2,160,782	35,027,686	..	..
114,674	*57,033*	*246,205*	*102,756*	*98,848*	*166,788*	*394,846*	*394,655*	*690,968*	*282,509*	*4,462,060*		
										*1,945,700		
..	..	..	..	..	..	..	..	..	..	628,317	..	..
										14,222		
..	4,200	9,452	23,000	68,763	..	7,000	12,727	6,249	48,454	598,782	..	..
	168	*378*	*920*	*2,749*		*280*	*142*	*467*	*2,558*	*49,628*		
61,949	..	..	..	..	..	..	..	..	..		..	..
12,825										4,963,272		
..	..	24,122	..	..	..	..	..	..	..	*1,047,280*	..	..
		4,827										
38,598	..	..	..	..	..	..	..	..	..	3,396,064	..	..
15,438										*1,218,615*		
..	..	..	..	..	..	..	..	..	..	..	(b) 2,774,100	(c) 240,138
											127,437	*27,503*
..	..	..	..	..	..	..	..	..	..	..	873,152	883,916
											65,241	*74,324*
..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	537,677	336,321
											67,056	*46,712*
1,394,813	994,484	2,412,865	851,046	683,089	933,253	2,496,563	2,988,919	6,863,113	2,209,236	44,614,121	4,184,929	1,460,374
142,937	*57,201*	*251,410*	*102,676*	*101,597*	*166,788*	*395,126*	*394,797*	*691,435*	*285,067*	*6,791,805*	*259,734*	*148,539*
										*1,945,700		

* It is estimated that of this sum about £750,000 relates to vessels completed prior to 1885–86.

(a) The figures for this year 1889–90 represent the revised estimated cost of the vessels to be completed.

(b) Includes £1,306,926 / *£110,956* } on account of Nile and Trafalgar.

(c) Includes £183,840 / *£22,675* } on account of Nile and Trafalgar.

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STATEMENT showing the Approximate Aggregate COST of the Effective Royal Navy, under the years of their completion.

For Details See Statement. No.	CLASS OF SHIP.	Prior to 1867-68.	1867-8.	1868-9.	1869-70.	1870-1.	1871-2.	1872-3.	1873-4.	1874-5.	1875-6.	1876-7.	1877-8.	1878-9.
	1. EFFECTIVE SHIPS:													
	COMBATANT:	£	£	£	£	£	£	£	£	£	£	£	£	£
3	Armoured . .	1,699,297	531,817	1,350,691	371,415	714,257	773,873	267,718	771,253	239,197	..	682,626	1,461,069	886,918
		273,433	*15,787*	*134,899*	*107,556*	*68,129*	*165,219*	*5,451*	*76,152*	*61,570*		*119,404*	*238,785*	*119,024*
3	Protected . .	..	..	..	..	..	..	..	..	..	..	..	..	..
3	Partially protected	..	..	..	..	..	..	..	..	..	..	..	..	123,913
														4,157
	Unprotected, viz.:													
3	Frigates . . .	..	..	..	226,260	..	..	..	..	210,234	..	..	..	..
					57,580					*59,582*				
3	Corvettes . . .	..	..	..	132,817	132,102	..	..	..	..	453,526	103,429	444,079	209,712
					2,578	*2,852*					*41,668*	*3,886*	*48,422*	*42,831*
3	Sloops . . .	..	..	..	..	..	..	..	..	..	..	..	228,257	111,174
													32,022	*28,877*
3	Torpedo Depot Ship, and Cruisers .	..	..	..	..	..	..	..	..	..	..	..	..	126,517
														5,060
3	Torpedo Gunboats	..	..	..	..	..	..	..	..	..	..	..	..	..
3	Gun-Vessels . .	..	..	..	..	..	..	..	54,297	..	36,661	..	77,671	..
									12,548		*1,290*		*10,125*	
2	Gunboats . . .	..	..	..	..	..	..	31,655	15,888	..	..	..	71,074	48,961
								7,757	*3,550*				*2,288*	*1,751*
3	Gunboats, Coast Defence . . .	..	..	6,719	..	7,751	88,539	54,059	43,855	..	..	..	40,714	217,838
				33		*2,388*	*15,111*	*5,489*	*266*				*3,192*	*17,688*
3	Despatch, Surveying Vessels, &c.	245,072	40,480	..	..	..	..	..	..	171,434	..	..	..	..
		62,317	*10,474*							*40,619*				
..	Torpedo Boats, Launches, &c. .	..	..	..	..	..	..	..	..	..	..	..	..	..
	£	1,944,369	572,297	1,357,410	730,492	854,110	862,412	353,432	885,293	620,865	490,187	786,055	2,322,864	1,725,033
		335,750	*26,261*	*134,932*	*167,714*	*73,369*	*180,330*	*13,697*	*92,516*	*101,771*	*42,958*	*123,290*	*354,834*	*220,356*
	NON-COMBATANT:													
3	Troop and Store Ships . . .	382,114	..	..	..	..	..	..	21,500	..	101,625	..	..	123,678
		9,558									*2,507*			*2,157*
..	Small Steam Vessels, Tugs, Tanks, &c. . .	235,299	13,187	26,514	22,054	..	..	..	37,798	8,018	50,521	..	25,546	..
		25,066	*527*	*1,060*	*882*				*2,749*	*320*	*10,341*		*1,021*	
	2. NON-EFFECTIVE SHIPS:													
..	Ships capable of being fitted, but not ordered . .	688,561	..	196,789	..	75,993	..	..	..	43,806	..	249,974	39,977	288,256
		29,275		*56,860*		*21,851*				*11,358*		*54,496*	*1,433*	*61,196*
..	Ships unfit for Service, or ordered to be sold, &c. .	2,913,095	84,511	..	..	..	15,499	..	36,719	42,932	140,888	..	60,201	..
		746,136	*12,016*				*6,199*		*10,661*	*2,147*	*6,323*		*9,705*	
	3. GUARD, RECEIVING, &c., SHIPS:													
..	Guard, Receiving, &c., Ships . .	3,243,120	48,469	21,879	..	..	25,843	16,230	..	..	..	..	1,925	..
		1,167,126	*19,387*	*1,874*			*7,528*	*6,492*					*770*	
	4. SHIPS NOT COMPLETE:													
..	Armoured . .	..	..	..	..	..	..	..	..	..	..	..	..	..
..	Protected . .	..	..	..	..	..	..	..	..	..	..	..	..	..
..	Partially Protected	..	..	..	..	..	..	..	..	..	..	..	..	..
..	Unprotected . .	..	..	..	..	..	..	..	..	..	..	..	..	..
	TOTAL . £	9,406,558	718,464	1,602,592	752,546	930,103	903,754	369,662	981,310	715,621	783,221	1,036,029	2,450,513	2,136,367
		2,312,911	*58,191*	*194,726*	*168,596*	*95,220*	*194,057*	*25,189*	*105,926*	*175,596*	*62,129*	*177,786*	*347,763*	*283,651*

NOTE.—The Figures in *Italics* represent the dockyard incidental charges apportioned to each Ship.

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and Non-Effective SHIPS at present on the Strength of the
(Incidental Charges printed in *Italics*).

1879-80.	1880-1.	1881-2.	1882-3.	1883-4.	1884-5.	1885-6.	1886-7.	1887-8.	1888-9 (a).	TOTAL First Cost.	Expended to 31st of March, 1889, on Vessels not yet Complete.	Outstanding Liabilities on 1st of April, 1889 on Ships Commenced.
£	£	£	£	£	£	£	£	£	£	£	£	£
414,434	531,846	1,912,964	296,761	..	530,015	1,210,109	2,227,135	5,001,015	1,195,753		..	..
13,374	*24,816*	*179,368*	*4,696*		*104,527*	*206,566*	*319,255*	*470,796*	*137,477*			
..	..	..	226,305	..	..	..	..	641,121	488,831	27,176,714	..	..
			49,476					*108,112*	*61,564*	*3,418,226*		
368,177	122,681	246,059	140,453	204,775	73,644	1,279,454	191,138	..	..		..	..
13,154	*4,759*	*31,834*	*37,556*	*46,547*	*17,783*	*188,280*	*8,770*					
..	..	..	..	..	..	..	..	..	..	436,494	..	..
										117,162		
464,155	..	..	..	234,860	..	..	..	..	..		..	..
79,074				*34,446*								
..	52,867	105,363	..	53,871	264,010	..	180,246	64,509	174,671		..	..
	13,826	*27,056*		*13,824*	*41,658*		*30,205*	*16,045*	*32,126*			
..	..	..	..	..	..	..	96,462	788,397	..		..	..
							4,781	*66,292*				
..	..	..	..	..	..	..	..	151,822	48,355		..	..
								22,634	*6,808*	7,414,478		
..	156,801	..	..	..	..	..	114,033	..	..	*926,672*	..	..
	6,616						*25,365*					
..	23,653	67,857	92,761	32,783	65,584	..	..	142,522	226,389		..	..
	4,350	*2,910*	*7,796*	*1,262*	*2,870*			*3,422*	*40,469*			
47,500	..	23,478	..	..	..	..	..	..	..		..	..
9,072		*4,324*										
..	102,436	23,570	71,766	88,037	..	..	167,178	67,478	26,783		..	..
	3,666	*733*	*3,232*	*2,769*			*6,279*	*3,667*	*4,065*			
..	..	..	..	..	..	..	..	..	..	*1,945,700	..	..
1,294,266	990,284	2,379,291	828,046	614,326	933,253	2,489,563	2,976,192	6,856,864	2,160,782	35,027,686	..	..
114,674	*57,033*	*246,205*	*102,756*	*98,848*	*166,788*	*394,846*	*394,655*	*690,968*	*282,509*	*4,462,060*		
										*1,945,700		
..	..	..	..	..	..	..	..	..	..	628,317	..	..
										14,232		
..	4,200	9,452	23,000	68,763	..	7,000	12,727	6,249	48,454	598,782	..	..
	168	*378*	*920*	*2,749*		*280*	*143*	*467*	*2,558*	*49,628*		
61,949	..	..	..	..	..	..	..	..	..		..	..
12,825										4,963,272		
..	..	24,122	..	..	..	..	..	..	..	*1,047,280*	..	..
		4,827										
38,598	..	..	..	..	..	..	..	..	..	3,396,064	..	..
15,438										*1,318,615*		
..	..	..	..	..	..	..	..	..	..	..	(b) 2,774,100	(c) 240,138
											127,437	*27,503*
..	..	..	..	..	..	..	..	..	..	..	873,152	883,915
											65,241	*74,324*
..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	537,677	336,321
											67,056	*46,712*
1,394,813	994,484	2,412,865	851,046	683,089	933,253	2,496,563	2,988,919	6,863,113	2,209,236	44,614,121	4,184,929	1,460,374
142,937	*57,201*	*251,410*	*103,676*	*101,597*	*166,788*	*395,126*	*394,797*	*691,435*	*285,067*	*6,791,805*	*259,734*	*148,539*
										1,945,700		

* It is estimated that of this sum about £750,000 relates to vessels completed prior to 1885–86.

(a) The figures for this year 1889–90 represent the revised estimated cost of the vessels to be completed.

(b) Includes £1,306,926 / £110,956 } on account of Nile and Trafalgar.

(c) Includes £183,840 / £23,675 } on account of Nile and Trafalgar.

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STATEMENT showing the FIRST COST of each EFFECTIVE SHIP of the
upon REPAIRS, ALTERATIONS, SEA STORES, &c.,

NAME OF SHIP.		1862–70.	1870–1.	1871–2.	1872–3.	1873–4.	1874–5.	1876–7.	1877–8.	1878–9.	1879–80.
ARMOURED SHIPS:		£	£	£	£	£	£	£	£	£	£
Black Prince	1862–3	377,954 *13,470*	..	..	..	..	..	..	..	..	..
Achilles	1864–5	469,572 *145,397*	..	..	..	..	..	..	..	..	..
Prince Albert	1865–6	208,305 *19,702*	..	..	..	..	..	..	..	..	..
Scorpion	1865–6	111,614 *550*	..	..	..	..	..	..	..	..	..
Wivern	1865–6	118,769 *331*	..	..	..	..	..	..	..	..	..
Bellerophon	1866–7	356,493 *91,125*	..	..	..	..	..	..	..	..	..
Vixen	1866–7	56,550 *2,858*	..	..	..	..	..	..	..	..	..
Minotaur	1867–8	478,360 *12,571*	..	..	..	..	..	..	..	..	..
Viper	1867–8	53,457 *3,216*	..	..	..	..	..	..	..	..	..
Agincourt	1868–9	483,003 *13,066*	..	..	..	..	..	..	..	..	..
Hercules	1868–9	377,008 *99,642*	..	..	..	..	..	..	..	..	..
Northumberland	1868–9	490,980 *22,191*	..	..	..	..	..	..	..	..	..
Monarch		371,415 *107,556*	..	..	..	..	..	..	..	..	..
Audacious		..	256,291 *6,897*	..	..	..	..	..	..	..	..
Invincible		..	249,203 *4,206*	..	..	..	..	..	..	..	..
Iron Duke		..	208,763 *57,026*	..	..	..	..	..	..	..	..
Glatton		..	..	223,101 *50,574*	..	..	..	..	..	..	..
Hotspur		..	..	175,995 *4,267*	..	..	..	..	..	..	..
Sultan		..	..	374,777 *110,378*	..	..	..	..	..	..	..
Swiftsure		..	..	..	267,718 *5,451*	..	..	..	..	..	..
Devastation		..	..	..	..	361,438 *69,308*	..	..	..	..	..
Gorgon		..	..	..	..	141,254 *1,284*	..	..	..	..	..
Triumph		..	..	..	..	268,561 *5,560*	..	..	..	..	..
Rupert		..	..	..	..	..	239,197 *61,570*	..	..	..	..
Cost of Armoured Ships in each year carried forward		3,953,220 *531,675*	714,257 *68,129*	773,873 *165,219*	267,718 *5,451*	771,253 *76,152*	239,197 *61,570*				

NOTE.—The Figures in *Italics* represent the Dockyard incidental charges apportioned to each ship.

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ROYAL NAVY under the Year of completion, with the subsequent OUTLAY inclusive of DOCKYARD INCIDENTAL EXPENDITURE.

1880-1.	1881-2.	1882-3.	1884-5.	1885-6.	1886-7.	1887-8.	1888-9.	Cost after Completion (including Sea Stores) to 31 March, 1888.	NAME OF SHIP.
£	£	£	£	£	£	£	£	£	**ARMOURED SHIPS:**
..	..	..	..	..	..	..	..	277,529 *69,233*	Black Prince.
..	..	..	..	..	..	..	..	164,654 *41,508*	Achilles.
..	..	..	..	..	..	..	..	44,635 *11,842*	Prince Albert.
..	..	..	..	..	..	..	..	43,470 *11,839*	Scorpion.
..	..	..	..	..	..	..	..	84,376 *20,926*	Wivern.
..	..	..	..	..	..	..	..	250,410 *63,183*	Bellerophon.
..	..	..	..	..	..	..	..	8,243 *2,239*	Vixen.
..	..	..	..	..	..	..	..	238,331 *61,689*	Minotaur.
..	..	..	..	..	..	..	..	13,235 *5,319*	Viper.
..	..	..	..	..	..	..	..	213,040 *53,491*	Agincourt.
..	..	..	..	..	..	..	..	202,821 *49,825*	Hercules.
..	..	..	..	..	..	..	..	233,524 *59,123*	Northumberland.
..	..	..	..	..	..	..	..	221,737 *55,250*	Monarch.
..	..	..	..	..	..	..	..	191,755 *47,435*	Audacious.
..	..	..	..	..	..	..	..	160,436 *39,615*	Invincible.
..	..	..	..	..	..	..	..	191,802 *47,944*	Iron Duke.
..	..	..	..	..	..	..	..	43,621 *10,908*	Glatton.
..	..	..	..	..	..	..	..	157,901 *38,993*	Hotspur.
..	..	..	..	..	..	..	..	193,847 *47,863*	Sultan.
..	..	..	..	..	..	..	..	158,667 *39,134*	Swiftsure.
..	..	..	..	..	..	..	..	113,074 *28,027*	Devastation.
..	..	..	..	..	..	..	..	41,641 *8,748*	Gorgon.
..	..	..	..	..	..	..	..	152,259 *38,105*	Triumph.
..	..	..	..	..	..	..	..	63,678 *15,807*	Rupert.
									Cost of Armoured Ships in each year carried forward.

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STATEMENT showing the FIRST COST of each EFFECTIVE SHIP of the upon REPAIRS, ALTERATIONS, SEA STORES, &c.

NAME OF SHIP.	1862–70.	1870–1.	1871–2.	1872–3.	1873–4.	1874–5.	1876–7.	1877–8.	1878–9.	1879–80.
ARMOURED SHIPS:	£	£	£	£	£	£	£	£	£	£
Black Prince (1862–3)	377,954 *13,470*	..	..	..	..	..	..	..	..	..
Achilles (1864–5)	469,572 *145,397*	..	..	..	..	..	..	..	..	..
Prince Albert (1865–6)	208,305 *19,702*	..	..	..	..	..	..	..	..	..
Scorpion (1865–6)	111,614 *550*	..	..	..	..	..	..	..	..	..
Wivern (1865–6)	118,769 *331*	..	..	..	..	..	..	..	..	..
Bellerophon (1866–7)	356,493 *91,125*	..	..	..	..	..	..	..	..	..
Vixen (1866–7)	56,550 *2,858*	..	..	..	..	..	..	..	..	..
Minotaur (1867–8)	478,360 *12,571*	..	..	..	..	..	..	..	..	..
Viper (1867–8)	53,457 *3,216*	..	..	..	..	..	..	..	..	..
Agincourt (1868–9)	483,003 *13,066*	..	..	..	..	..	..	..	..	..
Hercules (1868–9)	377,008 *99,642*	..	..	..	..	..	..	..	..	..
Northumberland (1868–9)	490,980 *22,191*	..	..	..	..	..	..	..	..	..
Monarch	371,415 *107,556*	..	..	..	..	..	..	..	..	..
Audacious	..	256,291 *6,897*	..	..	..	..	..	..	..	..
Invincible	..	249,203 *4,206*	..	..	..	..	..	..	..	..
Iron Duke	..	208,763 *57,026*	..	..	..	..	..	..	..	..
Glatton	..	..	223,101 *50,574*	..	..	..	..	..	..	..
Hotspur	..	..	175,995 *4,267*	..	..	..	..	..	..	..
Sultan	..	..	374,777 *110,378*	..	..	..	..	..	..	..
Swiftsure	..	..	..	267,718 *5,451*	..	..	..	..	..	..
Devastation	..	..	..	..	361,438 *69,308*	..	..	..	..	..
Gorgon	..	..	..	..	141,254 *1,284*	..	..	..	..	..
Triumph	..	..	..	..	268,561 *5,560*	..	..	..	..	..
Rupert	..	..	..	..	..	239,197 *61,570*	..	..	..	..
Cost of Armoured Ships in each year carried forward	3,953,220 *531,675*	714,257 *68,129*	773,873 *165,219*	267,718 *5,451*	771,253 *76,152*	239,197 *61,570*				

NOTE.—The Figures in *Italics* represent the Dockyard incidental charges apportioned to each ship.

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ROYAL NAVY under the Year of completion, with the subsequent OUTLAY inclusive of DOCKYARD INCIDENTAL EXPENDITURE.

1880-1.	1881-2.	1882-3.	1884-5.	1885-6.	1886-7.	1887-8.	1888-9.	Cost after Completion (including Sea Stores) to 31 March, 1888.	NAME OF SHIP.
£	£	£	£	£	£	£	£	£	**ARMOURED SHIPS:**
..	..	..	..	..	..	..	..	277,529 *69,233*	Black Prince.
..	..	..	..	..	..	..	..	164,654 *41,508*	Achilles.
..	..	..	..	..	..	..	..	44,635 *11,842*	Prince Albert.
..	..	..	..	..	..	..	..	43,470 *11,839*	Scorpion.
..	..	..	..	..	..	..	..	84,376 *20,926*	Wivern.
..	..	..	..	..	..	..	..	250,410 *63,183*	Bellerophon.
..	..	..	..	..	..	..	..	8,243 *2,239*	Vixen.
..	..	..	..	..	..	..	..	238,331 *61,689*	Minotaur.
..	..	..	..	..	..	..	..	13,235 *5,319*	Viper.
..	..	..	..	..	..	..	..	213,040 *53,491*	Agincourt.
..	..	..	..	..	..	..	..	202,821 *49,825*	Hercules.
..	..	..	..	..	..	..	..	233,524 *59,123*	Northumberland.
..	..	..	..	..	..	..	..	221,737 *55,250*	Monarch.
..	..	..	..	..	..	..	..	191,755 *47,435*	Audacious.
..	..	..	..	..	..	..	..	160,436 *39,615*	Invincible.
..	..	..	..	..	..	..	..	191,802 *47,944*	Iron Duke.
..	..	..	..	..	..	..	..	43,621 *10,908*	Glatton.
..	..	..	..	..	..	..	..	157,901 *38,993*	Hotspur.
..	..	..	..	..	..	..	..	193,847 *47,863*	Sultan.
..	..	..	..	..	..	..	..	158,667 *39,134*	Swiftsure.
..	..	..	..	..	..	..	..	113,074 *28,027*	Devastation.
..	..	..	..	..	..	..	..	41,641 *8,748*	Gorgon.
..	..	..	..	..	..	..	..	152,259 *38,105*	Triumph.
..	..	..	..	..	..	..	..	63,678 *15,807*	Rupert.
									Cost of Armoured Ships in each year carried forward.

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STATEMENT

NAME OF SHIP.	1862–3 to 1869–70.	1870–1.	1871–2.	1872–3.	1873–4.	1874–5.	1876–7.	1877–8.	1878–9.	1879–80.
ARMOURED SHIPS—*cont.*	£	£	£	£	£	£	£	£	£	£
Brought forward	3,953,220 *531,675*	714,257 *68,129*	773,873 *165,219*	267,718 *5,451*	771,253 *76,152*	239,197 *61,570*				
Alexandra	..	..	..	..	..	..	538,293 *115,622*	..	..	..
Hydra	..	..	..	..	..	..	144,333 *3,782*	..	..	..
Cyclops	..	..	..	..	..	..	..	156,782 *4,410*	..	..
Hecate	..	..	..	..	..	..	..	143,310 *4,123*	..	..
Shannon	..	..	..	..	..	..	..	302,727 *56,924*	..	..
Teméraire	..	..	..	..	..	..	..	489,822 *99,149*	..	..
Thunderer	..	..	..	..	..	..	..	368,428 *74,179*	..	..
Belleisle	..	..	..	..	..	..	..	..	267,179 *9,454*	..
Dreadnought	..	..	..	..	..	..	..	..	619,739 *109,570*	..
Northampton	..	..	..	..	..	..	..	..	..	414,434 *13,374*
Superb	..	..	..	..	..	..	..	..	..	..
Inflexible	..	..	..	..	..	..	..	..	..	..
Nelson	..	..	..	..	..	..	..	..	..	..
Neptune	..	..	..	..	..	..	..	..	..	..
Orion	..	..	..	..	..	..	..	..	..	..
Agamemnon	..	..	..	..	..	..	..	..	..	..
Ajax	..	..	..	..	..	..	..	..	..	..
Colossus	..	..	..	..	..	..	..	..	..	..
Collingwood	..	..	..	..	..	..	..	..	..	..
Conqueror	..	..	..	..	..	..	..	..	..	..
Edinburgh	..	..	..	..	..	..	..	..	..	..
Imperieuse	..	..	..	..	..	..	..	..	..	..
Australia	..	..	..	..	..	..	..	..	..	..
Benbow	..	..	..	..	..	..	..	..	..	..
Cost of Armoured Ships in each year carried forward	3,953,220 *531,675*	714,257 *68,129*	773,873 *165,219*	267,718 *5,451*	771,253 *76,152*	239,197 *61,570*	682,626 *119,404*	1,461,069 *238,785*	886,918 *119,024*	414,434 *13,374*

NOTE.—The Figures in *Italics* represent the Dockyard incidental charges apportioned to each ship.

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continued.

1880-1.	1881-2.	1882-3.	1884-5	1885-6	1886-7.	1887-8.	1888-9.	Cost after completion (including Sea Stores) to 31 March, 1888.	Name of Ship.
	-	£	£	£	£	£	£	£	**ARMOURED SHIPS**—*cont.*
									Brought forward.
..	..	..	..	..	..	..	..	87,902 *22,804*	Alexandra.
..	..	..	..	..	..	..	..	21,246 *5,317*	Hydra.
..	..	..	..	..	..	..	..	18,001 *4,809*	Cyclops.
..	..	..	..	..	..	..	..	34,800 *8,782*	Hecate.
..	..	..	..	..	..	..	..	62,540 *15,325*	Shannon.
..	..	..	..	..	..	..	..	64,885 *16,055*	Temeraire.
..	..	..	..	..	..	..	..	72,313 *18,374*	Thunderer.
..	..	..	..	..	..	..	..	34,481 *6,871*	Belleisle.
..	..	..	..	..	..	..	..	52,751 *13,182*	Dreadnought.
..	..	..	..	..	..	..	..	77,444 *22,117*	Northampton.
531,846 *24,816*	..	..	..	..	..	..	..	28,115 *8,501*	Superb.
..	812,485 *138,921*	..	..	..	..	..	..	67,986 *16,692*	Inflexible.
..	411,308 *16,422*	..	..	..	..	..	..	21,770 *4,454*	Nelson.
..	689,171 *24,025*	..	..	..	..	..	..	51,298 *14,510*	Neptune.
..	..	296,761 *4,696*	..	..	..	..	..	20,417 *4,591*	Orion.
..	..	..	530,015 *104,527*	..	..	..	..	24,704 *6,961*	Agamemnon.
..	..	..	..	548,393 *86,745*	..	..	..	21,709 *4,734*	Ajax.
..	..	..	..	661,716 *119,821*	..	..	..	18,301 *4,948*	Colossus.
..	..	..	..	..	636,248 *69,062*	..	..	7,291 *1,580*	Collingwood.
..	..	..	..	..	401,991 *71,467*	..	..	8,763 *2,388*	Conqueror.
..	..	..	..	..	645,138 *90,216*	..	..	7,914 *1,435*	Edinburgh.
..	..	..	..	..	543,758 *88,510*	..	..	21,144 *6,034*	Imperieuse.
..	..	..	..	..	..	267,108 *6,917*	..	429 *25*	Australia.
..	..	..	..	..	..	759,422 *14,587*	..	2,317 *145*	Benbow.
531,846 *24,816*	1,912,964 *179,368*	296,761 *4,696*	530,015 *104,527*	1,210,109 *206,566*	2,227,135 *319,255*	1,026,530 *21,504*			Cost of Armoured Ships in each year carried forward

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STATEMENT

NAME OF SHIP.	1862–3 to 1869–70.	1870–1.	1871–2.	1872–3.	1873–4.	1874–5.	1876–7.	1877–8.	1878–9.	1879–80.
ARMOURED SHIPS—*cont.*	£	£	£	£	£	£	£	£	£	£
Brought forward	3,953,220 *531,675*	714,257 *68,129*	773,873 *165,219*	267,718 *5,451*	771,253 *76,152*	239,197 *61,570*	682,626 *119,404*	1,461,069 *238,785*	886,918 *119,024*	414,43 *13,37*
Camperdown .	..	..	..	..	..	..	..	..	..	..
Galatea . . .	..	..	..	..	..	..	..	..	..	..
Hero	..	..	..	..	..	..	..	..	..	..
Howe . . .	..	..	..	..	..	..	..	..	..	..
Narcissus . .	..	..	..	..	..	..	..	..	..	..
Orlando . . .	..	..	..	..	..	..	..	..	..	..
Rodney . . .	..	..	..	..	..	..	..	..	..	..
Undaunted . .	..	..	..	..	..	..	..	..	..	..
Warspite . .	..	..	..	..	..	..	..	..	..	..
Anson . . .	..	..	..	..	..	..	..	..	..	..
Aurora . . .	..	..	..	..	..	..	..	..	..	..
Immortalité . .	..	..	..	..	..	..	..	..	..	..
Total cost of Armoured Ships in each year £	3,953,220 *531,675*	714,257 *68,129*	773,873 *165,219*	267,718 *5,451*	771,253 *76,152*	239,197 *61,570*	682,626 *119,404*	1,461,069 *238,785*	886,918 *119,024*	414,43 *13,37*
PROTECTED SHIPS:										
TORPEDO RAM—										
Polyphemus .	..	..	..	..	..	..	..	..	..	..
CRUISERS—										
Mersey . .	..	..	..	..	..	..	..	..	..	..
Severn . .	..	..	..	..	..	..	..	..	..	..
Thames . .	..	..	..	..	..	..	..	..	..	..
Forth . . .	..	..	..	..	..	..	..	..	..	..
Medea . . .	..	..	..	..	..	..	..	..	..	..
Medusa . .	..	..	..	..	..	..	..	..	..	..
Total Protected Ships . .	..	..	..	..	..	..	..	..	..	..

NOTE.—The Figures in *Italics* represent the Dockyard incidental charges apportioned to each ship.

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continued.

1880–1.	1881–2.	1882–3.	1884–5.	1885–6.	1886–7.	1887–8.	1888–9. (a)	Cost after Completion (including Sea Stores) to 31 March, 1888.	Name of Ship.
£	£	£	£	£	£	£	£	£	**ARMOURED SHIPS**—*cont.*
531,846	1,912,964	296,761	530,015	1,210,109	2,227,135	1,026,530	..	..	Brought forward.
24,816	*179,368*	*4,696*	*104,527*	*206,566*	*319,255*	*21,504*			
..	..	..	..	..	..	676,656	..	821	Camperdown.
						92,890		*68*	
..	..	..	..	..	..	260,469	..	124	Galatea.
						6,332		*4*	
..	..	..	..	..	..	387,861	..	2,475	Hero.
						62,167		*167*	
..	..	..	..	..	..	643,759	..	2,986	Howe.
						66,936		*129*	
..	..	..	..	..	..	268,144	..	64	Narcissus.
						7,003		*4*	
..	..	..	..	..	..	270,190	..	2,964	Orlando.
						7,873		*123*	
..	..	..	..	..	..	665,539	..	3,918	Rodney.
						104,933		*504*	
..	..	..	..	..	..	268,985	..	2,212	Undaunted.
						6,876		*92*	
..	..	..	..	..	..	532,882	..	4,685	Warspite.
						94,282		*634*	
..	..	..	..	..	..	..	661,533	400	Anson.
							63,232	*13*	
..	..	..	..	..	..	..	268,809	..	Aurora.
							32,299		
..	..	..	..	..	..	..	265,411	..	Immortalité.
							41,946		
531,846	1,912,964	296,761	530,015	1,210,109	2,227,135	5,001,015	1,195,753	..	Total cost of Armoured Ships in each year.
24,816	*179,368*	*4,696*	*104,527*	*206,566*	*319,255*	*470,796*	*137,477*	..	
									PROTECTED SHIPS:
									Torpedo Ram—
..	..	226,305	..	..	..	..	..	59,788	Polyphemus.
		49,476						*13,000*	
									Cruisers—
..	..	..	..	..	..	217,982	..	3,981	Mersey.
						42,020		*569*	
..	..	..	..	..		210,177	..	2,468	Severn.
						36,478		*291*	
..	..	..	..	..	..	212,962	..	2,363	Thames.
						29,614		*111*	
..	..	..	..	..	..	..	202,840	78	Forth.
							26,203	*3*	
..	..	..	..	..	..	..	143,396	..	Medea.
							17,654		
..	..	..	..	..	..	..	142,595	..	Medusa.
							17,707		
..	..	226,305	..	..	..	641,121	488,831	..	Total Protected Ships.
		49,476				*108,112*	*61,564*		

(a) The figures for this year represent the revised estimated cost of each vessel.

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STATEMENT

NAME OF SHIP.	1878-9.	1879-80.	1880-1.	1881-2.	1882-3.
PARTIALLY PROTECTED SHIPS:					
CRUISERS—	£	£	£	£	£
Comus	123,913 *4,157*	..	..	..	..
Carysfort	..	123,678 *4,493*	..	..	..
Champion	..	122,903 *4,144*	..	..	..
Curaçoa	..	121,596 *4,517*	..	..	..
Cleopatra	..	..	122,681 *4,759*	..	..
Constance	..	..	..	123,015 *26,800*	..
Conquest	..	..	..	123,044 *5,034*	..
Heroine	..	..	..	..	72,397 *19,002*
Satellite	..	..	..	..	68,056 *18,554*
Canada	..	..	..	..	..
Hyacinth	..	..	..	..	..
Rapid	..	..	..	..	..
Amphion	..	..	..	..	..
Calliope	..	..	..	..	..
Calypso	..	..	..	..	..
Caroline	..	..	..	..	..
Cordelia	..	..	..	..	..
Leander	..	..	..	..	..
Phaeton	..	..	..	..	..
Pylades	..	..	..	..	..
Royalist	..	..	..	..	..
Arethusa	..	..	..	..	..
Total cost of Partially Protected Ships in each year. £	123,913 *4,157*	368,177 *13,154*	122,681 *4,759*	246,059 *31,834*	140,453 *37,556*

NOTE.—The Figures in *Italics* represent the Dockyard incidental charges apportioned to each ship.

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continued.

1883–4.	1884–5.	1885–6.	1886–7.	Cost after Completion (including Sea Stores) to 31 March, 1888.	Name of Ship.
					PARTIALLY PROTECTED SHIPS:
£	£	£	£	£	Cruisers—
..	..	..	..	52,597 *13,528*	Comus.
..	..	..	..	20,986 *8,266*	Carysfort.
..	..	..	..	29,677 *10,209*	Champion.
..	..	..	..	45,939 *12,420*	Curaçoa.
..	..	..	..	16,869 *5,436*	Cleopatra.
..	..	..	..	11,611 *3,132*	Constance.
..	..	..	..	11,678 *2,920*	Conquest.
..	..	..	..	5,652 *1,931*	Heroine.
..	..	..	..	6,357 *1,913*	Satellite.
131,565 *27,269*	..	..	..	13,870 *6,960*	Canada.
73,210 *19,278*	..	..	..	3,020 *662*	Hyacinth.
..	73,644 *17,733*	..	..	4,163 *1,011*	Rapid.
..	..	202,113 *26,351*	..	5,926 *1,477*	Amphion.
..	..	157,930 *27,110*	..	5,149 *1,579*	Calliope.
..	..	165,552 *32,905*	..	11,932 *3,610*	Calypso.
..	..	81,002 *20,431*	..	4,240 *1,293*	Caroline.
..	..	130,875 *26,607*	..	6,553 *1,964*	Cordelia.
..	..	191,882 *8,526*	..	17,325 *4,324*	Leander.
..	..	189,672 *8,337*	..	8,291 *3,139*	Phaeton.
..	..	82,071 *20,419*	..	4,918 *1,981*	Pylades.
..	..	78,357 *17,594*	..	5,013 *1,419*	Royalist.
..	..	..	191,138 *8,770*	5,259 *1,242*	Arethusa.
204,775 *46,547*	73,644 *17,733*	1,279,454 *188,280*	191,138 *8,770*	..	£ (Total cost of Partially Protected Ships in each year.)

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STATEMENT

NAME OF SHIP.	1869–70.	1870–1.	1874–5.	1875–6.	1876–7.
UNPROTECTED SHIPS:	£	£	£	£	£
FRIGATES—					
Inconstant . .	226,260 *57,580*	..	..	..	..
Raleigh . . .	..	..	210,234 *59,582*	..	..
Total cost of Frigates in each year. . £	226,260 *57,580*	..	210,234 *59,582*	..	..
CORVETTES—					
Volage . . .	132,817 *2,578*	..	..	..	..
Active . . .	..	132,102 *2,852*	..	..	..
Diamond . .	..	..	..	85,770 *18,065*	..
Opal	..	..	..	102,824 *3,031*	..
Rover . . .	..	..	..	178,033 *3,559*	..
Sapphire . .	..	..	..	86,899 *17,013*	..
Tourmaline . .	..	..	..	..	103,429 *3,886*
Boadicea . .	..	..	..	..	..
Ruby . . .	..	..	..	..	..
Turquoise . .	..	..	..	..	..
Emerald . . .	..	..	..	..	..
Garnet . . .	..	..	..	..	..
Bacchante . .	..	..	..	..	..
Iris	..	..	..	..	..
Mercury . . .	..	..	..	..	..
Total cost of Corvettes in each year . £	132,817 *2,578*	132,102 *2,852*	..	453,526 *41,668*	103,429 *3,886*
SLOOPS—					
Osprey . . .	..	..	..	..	..
Pelican . . .	..	..	..	..	..
Cost of Sloops in each year carried forward . £	..	..	..	..	..

NOTE.—The Figures in *Italics* represent the Dockyard incidental charges apportioned to each ship.

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continued.

1877-8.	1878-9.	1879-80.	1883-4.	Cost after Completion (including Sea Stores) to 31 March, 1888.	Name of Ship.
£	£	£	£	£	**UNPROTECTED SHIPS:**
					Frigates—
..	..	..	..	141,783	Inconstant
				29,622	
..	..	..	..	144,171	Raleigh.
				37,432	
..	..	..	..	..	£ {Total cost of Frigates in each year.
					Corvettes—
..	..	..	..	100,806	Volage.
				24,992	
..	..	..	..	111,115	Active.
				27,574	
..	..	..	..	41,155	Diamond.
				10,087	
..	..	..	..	49,595	Opal.
				12,252	
..	..	..	..	68,116	Rover.
				17,213	
..	..	..	..	47,180	Sapphire.
				11,801	
..	..	..	..	72,325	Tourmaline.
				19,249	
236,811	..	..	..	60,155	Boadicea.
41,095				*14,776*	
102,024	..	..	..	46,938	Ruby.
3,039				*11,226*	
105,244	..	..	..	44,225	Turquoise.
4,288				*10,647*	
..	107,424	..	..	51,289	Emerald.
	19,593			*13,791*	
..	102,288	..	..	51,454	Garnet.
	24,238			*14,235*	
..	..	240,103	..	54,589	Bacchante.
		46,133		*13,503*	
..	..	224,052	..	56,766	Iris.
		32,961		*14,482*	
..	..	..	234,860	27,290	Mercury.
			34,446	*7,735*	
444,079	209,712	464,155	234,860	..	£ {Total cost of Corvettes in each year.
48,422	*43,831*	*79,074*	*34,446*		
					Sloops—
56,155	..	..	..	29,476	Osprey.
13,815				*6,880*	
60,431	..	..	..	26,455	Pelican.
14,420				*6,599*	
116,586	..	..	..	..	£ {Cost of Sloops in each year carried forward.
28,235					

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STATEMENT

NAME OF SHIP.	1877–8.	1878–9.	1880–1.	1881–2.	1883–4.
UNPROTECTED SHIPS—*continued.*					
SLOOPS—*continued.*	£	£	£	£	£
Brought forward.	116,586 *28,235*	..	..	..	..
Penguin . . .	55,800 *1,777*	..	..	..	..
Wild Swan . .	55,871 *2,010*	..	..	..	..
Cormorant . .	..	53,884 *14,295*	..	..	..
Gannet . . .	..	57,290 *14,582*	..	..	..
Espiegle . .	..	..	..	53,025 *13,666*	..
Miranda . . .	..	..	52,867 *12,826*	..	..
Mutine . . .	..	..	..	52,338 *13,370*	..
Kingfisher . .	..	..	..	..	53,871 *13,[illegible]*
Dolphin . . .	..	..	..	..	..
Mariner . . .	..	..	..	..	..
Racer . . .	..	..	..	..	..
Reindeer . .	..	..	..	..	..
Wanderer . .	..	..	..	..	..
Acorn . . .	..	..	..	..	..
Icarus . . .	..	..	..	..	..
Swallow . . .	..	..	..	..	..
Buzzard . . .	..	..	..	..	..
Daphne . . .	..	..	..	..	..
Melita . . .	..	..	..	..	..
Nymph . . .	..	..	..	..	..
Total cost of Sloops in each year . £	228,257 *32,022*	111,174 *28,877*	52,867 *12,826*	105,363 *27,036*	53,871 *13,[illegible]*

NOTE.—The Figures in *Italics* represent the Dockyard incidental charges apportioned to each ship.

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continued.

1884–5.	1886–7.	1887–8.	1888–9. (a)	Cost after Completion (including Sea Stores) to 31 March, 1888.	NAME OF SHIP.
					UNPROTECTED SHIPS—*continued.*
£	£	£	£	£	SLOOPS—*continued.*
..	..	..	..	..	Brought forward.
..	..	..	..	30,817 *7,796*	Penguin.
..	..	..	..	33,789 *8,448*	Wild Swan.
..	..	..	..	24,822 *6,502*	Cormorant.
..	..	..	..	25,921 *6,931*	Gannet.
..	..	..	..	25,911 *6,848*	Espiegle.
..	..	..	..	2,167 *923*	Miranda.
..	..	..	..	21,374 *7,121*	Mutine.
..	..	..	..	8,585 *1,806*	Kingfisher.
47,087 *2,175*	..	..	..	6,491 *2,041*	Dolphin.
57,992 *12,974*	..	..	..	4,595 *1,177*	Mariner.
57,647 *12,834*	..	..	..	4,129 *1,141*	Racer.
55,052 *11,706*	..	..	..	4,008 *780*	Reindeer.
46,232 *1,969*	..	..	..	5,537 *1,978*	Wanderer.
..	58,379 *2,639*	..	..	2,194 *708*	Acorn.
..	58,043 *12,437*	..	..	2,408 *528*	Icarus.
..	63,824 *15,129*	..	..	2,297 *436*	Swallow.
..	..	64,509 *16,045*	..	1,054 *92*	Buzzard.
..	..	..	56,021 *11,943*	..	Daphne.
..	..	..	60,799 *11,490*	..	Melita.
..	..	..	57,851 *8,693*	..	Nymphe.
264,010 *41,658*	180,246 *30,205*	64,509 *16,045*	174,671 *32,126*	..	Total cost of Sloops in each year.

(a) The figures for this year represent the revised estimated cost of each vessel.

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STATEMENT

NAME OF SHIP.	1877-8.	1878-9.	1879-80.	1880-1.	1881-2.
UNPROTECTED SHIPS—*continued.*					
TORPEDO DEPOT-SHIP—	£	£	£	£	£
Hecla . . .	..	126,517 *5,060*	..	..	..
TORPEDO CRUISERS					
Scout . . .	..	..	..	..	..
Archer . . .	..	..	..	..	..
Brisk. . . .	..	..	..	..	..
Cossack . . .	..	..	..	..	..
Fearless . . .	..	..	..	..	..
Mohawk . . .	..	..	..	..	..
Porpoise . . .	..	..	..	..	..
Racoon . . .	..	..	..	..	..
Serpent . . .	..	..	..	..	..
Tartar . . .	..	..	..	..	..
Total cost of Torpedo Depot Ship and Torpedo Cruisers in each year . . . £	..	126,517 *5,060*	..	..	..
TORPEDO GUNBOATS					
Grasshopper .	..	..	..	..	..
Rattlesnake . .	..	..	..	..	..
Sandfly . . .	..	..	..	..	..
Spider . . .	..	..	..	..	..
Sharpshooter .	..	..	..	..	..
Total cost of Torpedo Gunboats in each year . £	..	..	..	..	..

NOTE.—The Figures in *Italics* represent the Dockyard incidental charges apportioned to each ship.

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continued.

1885–6.	1886–7.	1887–8.	1888–9. (a)	Cost after Completion (including Sea Stores) to 31 March, 1888.	Name of Ship.
					UNPROTECTED SHIPS—*continued.*
£	£	£	£	£	Torpedo Depot-Ship—
..	..	..	..	47,835 *12,102*	Hecla.
					Torpedo Cruisers
..	96,462 *4,781*	..	..	4,301 *1,219*	Scout.
..	..	84,608 *4,184*	..	2,668 *503*	Archer.
..	..	86,669 *4,476*	..	1,746 *145*	Brisk.
..	..	85,043 *4,552*	..	1,705 *101*	Cossack.
..	..	87,894 *4,231*	..	2,377 *329*	Fearless.
..	..	83,895 *4,807*	..	2,427 *484*	Mohawk.
..	..	86,133 *3,985*	..	1,648 *102*	Porpoise.
..	..	93,812 *17,262*	..	1,026 *42*	Racoon.
..	..	93,722 *17,896*	..	1,395 *57*	Serpent.
..	..	86,621 *4,899*	..	1,542 *41*	Tartar.
..	96,462 *4,781*	788,397 *66,292*	..	..	£ Total cost of Torpedo Depot Ship and Torpedo Cruisers in each year.
					Torpedo Gunboats
..	..	37,390 *7,785*	..	186 *23*	Grasshopper.
..	..	36,603 *548*	..	2,059 *344*	Rattlesnake.
..	..	38,748 *7,186*	..	582 *27*	Sandfly.
..	..	39,081 *7,115*	..	730 *32*	Spider.
..	..	..	48,355 *6,808*	..	Sharpshooter.
..	..	151,822 *22,634*	48,355 *6,808*	..	Total cost of Torpedo Gunboats in each year.

(a) The Figures for this year represent the revised estimated cost of the vessel.

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STATEMENT

NAME OF SHIP.	1872–3.	1873–4.	1875–6.	1877–8.	1878–9.
UNPROTECTED SHIPS—*continued.*	£	£	£	£	£
GUN VESSELS—					
Ready . . .	..	26,709 *4,736*	..	..	..
Rifleman. . .	..	27,588 *7,812*	..	..	..
Lily	..	..	36,661 *1,290*	..	..
Flamingo . .	..	..	..	38,265 *8,971*	..
Griffon . . .	..	..	..	39,406 *1,154*	..
Algerine. . .	..	..	..	..	..
Linnet . . .	..	..	..	..	..
Ranger . . .	..	..	..	..	..
Swift. . . .	..	..	..	..	..
Curlew . . .	..	..	..	..	..
Landrail . .	..	..	..	..	..
Total cost of Gun Vessels in each year £	..	54,297 *12,548*	36,661 *1,290*	77,671 *10,125*	..
GUNBOATS—					
Goshawk . .	15,912 *3,898*	..	..	..	..
Merlin . . .	15,743 *3,859*	..	..	..	..
Swinger . . .	..	15,888 *3,550*	..	..	..
Firm. . . .	..	..	..	24,437 *808*	..
Forester . . .	..	..	..	24,373 *758*	..
Forward . . .	..	..	..	22,264 *722*	..
Firebrand . .	..	..	..	..	24,575 *898*
Firefly . . .	..	..	..	..	24,386 *823*
Redwing. . .	..	..	..	..	..
Cost of Gunboats in each year carried forward . £	31,655 *7,157*	15,888 *3,550*	..	71,074 *2,288*	48,961 *1,721*

NOTE.—The Figures in *Italics* represent the Dockyard incidental charges apportioned to each ship.

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continued.

1880–1.	1881–2.	1882–3.	1883–4.	Cost after Completion (including Sea Stores) to 31 March, 1888.	Name of Ship.
£	£	£	£	£	**UNPROTECTED SHIPS**—*continued.*
					Gun Vessels—
..	..	..	..	29,729	Ready.
				8,491	
..	..	..	..	28,532	Rifleman.
				7,155	
..	..	..	..	22,680	Lily.
				6,852	
..	..	..	..	23,369	Flamingo.
				6,708	
..	..	..	..	22,391	Griffon.
				6,365	
40,710	..	..	..	12,372	Algerine.
1,923				*3,481*	
38,211	..	..	..	3,776	Linnet.
1,529				*1,006*	
40,844	..	..	..	7,640	Ranger.
1,978				*1,514*	
37,036	..	..	..	6,143	Swift.
1,186				*2,040*	
..	..	..	..	3,024	Curlew.
				929	
..	..	..	..	3,407	Landrail.
				1,491	
156,801	..	..	..	..	£ Total cost of Gun Vessels in each year.
6,616					
					Gunboats—
..	..	..	..	15,843	Goshawk.
				4,247	
..	..	..	..	26,194	Merlin.
				6,592	
..	..	..	..	16,864	Swinger.
				4,130	
..	..	..	..	9,200	Firm.
				2,014	
..	..	..	..	6,862	Forester.
				1,949	
..	..	..	..	14,143	Forward.
				4,239	
..	..	..	..	14,712	Firebrand.
				4,192	
..	..	..	..	11,936	Firefly.
				3,034	
23,653	..	..	..	3,719	Redwing.
4,350				*738*	
23,653	..	..	..	..	Cost of Gunboats in each year carried forward.
4,350					

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STATEMENT

NAME OF SHIP.	1872–3.	1873–4.	1877–8.	1878–9.	1880–1.	1881 2.
UNPROTECTED SHIPS—*continued.*						
GUNBOATS—*cont.*	£	£	£	£	£	£
Brought forward	31,655 *7,757*	15,888 *3,550*	71,074 *2,288*	48,961 *1,721*	23,653 *4,350*	..
Banterer . .	..	..	..	..	..	22,643 *969*
Grappler. . .	..	..	..	..	..	22,487 *998*
Wrangler . .	..	..	..	..	..	22,727 *943*
Cockchafer . .	..	..	..	..	..	..
Espoir . . .	..	..	..	..	..	..
Raven . . .	..	..	..	..	..	..
Starling . . .	..	..	..	..	..	..
Albacore. . .	..	..	..	..	..	..
Mistletoe . .	..	..	..	..	..	..
Watchful . .	..	..	..	..	..	..
Bramble . . .	..	..	..	..	..	..
Lizard . . .	..	..	..	..	..	..
Rattler . . .	..	..	..	..	..	..
Partridge . .	..	..	..	..	..	..
Peacock . . .	..	..	..	..	..	..
Pheasant . .	..	..	..	..	..	..
Pigeon . . .	..	..	..	..	..	..
Pigmy . . .	..	..	..	..	..	..
Plover . . .	..	..	..	..	..	..
Total cost of Gunboats in each year . £	31,655 *7,757*	15,888 *3,550*	71,074 *2,288*	48,961 *1,721*	23,653 *4,350*	67,857 *2,910*

NOTE.—The Figures in *Italics* represent the Dockyard incidental charges apportioned to each ship.

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continued.

1882–3.	1883–4.	1884–5.	1887–8.	1888–9. (a).	Cost after Completion (including Sea Stores) to 31 March, 1888.	Name of Ship.
						UNPROTECTED SHIPS—*continued.*
£	£	£	£	£	£	Gunboats—*cont.*
						Brought forward.
..	..	..	..	..	3,741 *975*	Banterer.
..	..	..	..	..	3,124 *1,212*	Grappler.
..	..	..	..	..	7,019 *2,640*	Wrangler.
23,681 *4,813*	..	..	..	..	2,955 *792*	Cockchafer.
22,825 *1,104*	..	..	..	..	3,144 *887*	Espoir.
23,046 *912*	..	..	..	..	1,626 *357*	Raven.
23,209 *967*	..	..	..	..	5,119 *1,750*	Starling.
..	32,783 *1,262*	..	..	..	4,120 *1,385*	Albacore.
..	..	33,057 *1,564*	..	..	2,379 *513*	Mistletoe.
..	..	32,527 *1,306*	..	..	1,379 *359*	Watchful.
..	..	..	49,892 *1,114*	..	1,375 *224*	Bramble.
..	..	..	52,945 *1,199*	..	1,336 *214*	Lizard.
..	..	..	39,685 *1,109*	..	1,372 *357*	Rattler.
..	..	..	..	37,892 *9,157*	..	Partridge.
..	..	..	..	37,665 *4,784*	..	Peacock.
..	..	..	..	37,849 *9,170*	..	Pheasant.
..	..	..	..	37,623 *4,803*	..	Pigeon.
..	..	..	..	37,738 *7,933*	..	Pigmy.
..	..	..	..	37,622 *4,621*	..	Plover.
92,761 *7,796*	32,783 *1,262*	65,584 *2,870*	142,522 *3,422*	226,389 *40,469*	..	Total cost of Gunboats in each year.

(a) The Figures for this year represent the revised estimated cost of each vessel.

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STATEMENT

NAME OF SHIP.	1868–9 and 1870–71.	1871–2.	1872–3.	1873–4.	1877–8.
UNPROTECTED SHIPS—*continued.*					
GUNBOATS, COAST DEFENCE—	£	£	£	£	£
Staunch	6,719 *33*	..	..	..	..
Plucky	7,751 *2,388*	..	..	..	..
Arrow	..	8,169 *345*	..	..	..
Blazer	..	8,756 *2,676*	..	..	..
Bloodhound	..	8,692 *360*	..	..	..
Bonetta	..	8,103 *357*	..	..	..
Bustard	..	8,539 *260*	..	..	..
Comet	..	8,740 *2,972*	..	..	..
Kite	..	8,471 *243*	..	..	..
Mastiff	..	8,759 *348*	..	..	..
Scourge	..	10,161 *3,758*	..	..	..
Snake	..	10,149 *3,792*	..	..	..
Badger	..	..	8,954 *2,610*	..	..
Bulldog	..	..	9,059 *73*	..	..
Fidget	..	..	9,006 *2,636*	..	..
Pickle	..	..	8,986 *46*	..	..
Pike	..	..	9,066 *70*	..	..
Snap	..	..	8,988 *54*	..	..
Ant	..	..	..	10,969 *69*	..
Cuckoo	..	..	..	10,970 *74*	..
Hyæna	..	..	..	10,970 *62*	..
Weazel	..	..	..	10,946 *61*	..
Medina	..	..	..	..	20,468 *1,595*
Cost of Gunboats (Coast Defence) in each year carried forward £	14,470 *2,488*	88,539 *15,111*	54,059 *5,489*	43,855 *266*	20,468 *1,595*

NOTE.—The Figures in *Italics* represent the Dockyard incidental charges apportioned to each ship.

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continued.

1878–9.	1879–80.	1880–1.	1881–2.	Cost after Completion (including Sea Stores) to 31 March, 1888.	Name of Ship.
					UNPROTECTED SHIPS—*continued.*
£	£	£	£	£	Gunboats, Coast Defence—
..	..	..	..	5,496 *1,397*	Staunch.
..	..	..	..	7,004 *1,765*	Plucky.
..	..	..	..	5,372 *1,378*	Arrow.
..	..	..	..	3,512 *866*	Blazer.
..	..	..	..	12,003 *2,951*	Bloodhound.
..	..	..	..	4,604 *1,110*	Bonetta.
..	..	..	..	3,034 *780*	Bustard.
..	..	..	..	8,032 *1,974*	Comet.
..	..	..	..	4,302 *1,121*	Kite.
..	..	..	..	3,396 *875*	Mastiff.
..	..	..	..	3,902 *971*	Scourge.
..	..	..	..	5,968 *1,471*	Snake.
..	..	..	..	1,472 *395*	Badger.
..	..	..	..	3,982 *1,051*	Bulldog.
..	..	..	..	1,439 *389*	Fidget.
..	..	..	..	1,785 *466*	Pickle.
..	..	..	..	5,272 *1,254*	Pike.
..	..	..	..	4,717 *1,119*	Snap.
..	..	..	..	2,681 *692*	Ant.
..	..	..	..	4,607 *1,100*	Cuckoo.
..	..	..	..	1,771 *465*	Hyæna.
..	..	..	..	2,066 *534*	Weazel.
..	..	..	..	7,405 *2,031*	Medina.
..	..	..	..	..	Cost of Gunboats (Coast Defence) in each year carried forward.

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STATEMENT

NAME OF SHIP.	1868–69 and 1870–71.	1871–2.	1872–3.	1873–4.	1877–8.	1878–9.
UNPROTECTED SHIPS—*continued.*						
GUNBOATS, COAST DEFENCE—*contd.*	£	£	£	£	£	£
Brought forward	14,470 *2,488*	88,539 *15,111*	54,059 *5,489*	43,855 *266*	20,468 *1,595*	..
Medway . . .	..	..	..	..	20,246 *1,597*	..
Dee	..	..	..	..	..	21,993 *1,805*
Don	..	..	..	..	..	22,058 *1,819*
Esk	..	..	..	..	..	21,112 *1,496*
Sabrina . . .	..	..	..	..	..	21,591 *2,144*
Slaney . . .	..	..	..	..	..	21,652 *1,493*
Spey	..	..	..	..	..	22,397 *2,109*
Tay	..	..	..	..	..	21,863 *1,947*
Tees	..	..	..	..	..	22,269 *1,983*
Trent . . .	..	..	..	..	..	21,323 *1,431*
Tweed . . .	..	..	..	..	..	21,580 *1,459*
Gadfly . . .	..	..	..	..	..	..
Griper . . .	..	..	..	..	..	..
Pincher . . .	..	..	..	..	..	..
Tickler . . .	..	..	..	..	..	..
Bouncer . . .	..	..	..	..	..	..
Insolent . . .	..	..	..	..	..	..
Total cost of Gunboats (Coast Defence) in each year . . . £	14,470 *2,488*	88,539 *15,111*	54,059 *5,489*	43,855 *266*	40,714 *3,192*	217,838 *17,686*
DESPATCH VESSELS—						
Alacrity . . .	..	..	..	..	..	..
Surprise . . .	..	..	..	..	..	..
Cost of Despatch Vessels in each year carried forward . . . £						

NOTE.—The Figures in *Italics* represent the Dockyard incidental charges apportioned to each ship.

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continued.

1879–80.	1881–2.	1884–5.	1885–6.	1886–7.	Cost after Completion (including Sea Stores) to 31 March, 1888.	Name of Ship.
						UNPROTECTED SHIPS—*continued.*
£	£	£	£	£	£	Gunboats, Coast Defence—*cont.*
						Brought forward.
..	..	..	..	..	6,789 *1,958*	Medway.
..	..	..	..	..	7,289 *2,077*	Dee.
..	..	..	..	..	6,496 *2,018*	Don.
..	..	..	..	..	6,999 *1,862*	Esk.
..	..	..	..	..	6,310 *1,591*	Sabrina.
..	..	..	..	..	4,227 *1,073*	Slaney.
..	..	..	..	..	3,228 *860*	Spey.
..	..	..	..	..	6,962 *1,755*	Tay.
..	..	..	..	..	3,345 *825*	Tees.
..	..	..	..	..	6,193 *1,581*	Trent.
..	..	..	..	..	6,376 *1,679*	Tweed.
11,941 *2,254*	..	..	..	..	1,936 *577*	Gadfly.
11,808 *2,273*	..	..	..	..	1,551 *458*	Griper.
11,931 *2,262*	..	..	..	..	2,024 *494*	Pincher.
11,820 *2,283*	..	..	..	..	1,498 *424*	Tickler.
..	11,742 *2,162*	..	..	..	1,864 *478*	Bouncer.
..	11,736 *2,162*	..	..	..	1,777 *483*	Insolent.
47,500 *9,072*	23,478 *4,324*	..	..	..	.. £	Total cost of Gun boats (Coast Defence) in each year.
						Despatch Vessels—
..	..	..	..	83,684 *3,025*	6,908 *2,064*	Alacrity.
..	..	..	..	83,494 *3,254*	6,537 *1,755*	Surprise.
..	..	..	..	167,178 *6,279*	..	Cost of Despatch Vessels in each year carried forward.

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STATEMENT

NAME OF SHIP.	1846–7.	1865–6.	1874–5.	1880–1.	1882–3.	1883–4.
UNPROTECTED SHIPS—*continued.*						
DESPATCH VESSELS—*continued.*	£	£	£	£	£	£
Brought forward.						
PADDLE DESPATCH VESSELS—						
Enchantress (late Helicon) . .	..	46,992 *10,666*	..	..	..	..
YACHT—						
Imogene (purchased in 1884)	..	..	..	..	..	18,023 *961*
PADDLE YACHTS—		1854–5.				
Victoria and Albert . .	..	136,441 *40,379*	..	..	..	..
Osborne . . .	..	..	105,919 *28,064*	..	..	..
SPECIAL SERVICE STEAMERS—						
Screw—						
Vesuvius. . .	..	. .	18,405 *3,435*	..	..	..
Seahorse . .	..	..	..	29,225 *645*	..	..
Fire Queen (purchased in 1883)	..	..	..	..	..	14,995 *547*
Hearty (purchased in 1885)	..	..	..	..	..	..
Jackal (purchased in 1885)	..	..	..	..	..	..
Paddle—						
Sphinx . . .	..	..	..	..	..	55,019 *1,261*
PADDLE SMALL STEAMERS—						
Harpy . . .	17,193 *954*	..	..	..	..	..
Cockatrice . .	..	..	..	32,381 *1,438*	..	..
Alecto . . .	..	..	..	..	33,336 *1,051*	..
Cost of Despatch Vessels, &c., in each year, carried forward .	£17,193 *954*	46,992 *10,666*	124,324 *31,499*	61,606 *2,083*	33,336 *1,051*	88,037 *2,769*

NOTE.—The Figures in *Italics* represent the Dockyard incidental charges apportioned to each ship.

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continued.

1884–5.	1885–6.	1886–7.	1887–8.	1888–9.	Cost after Completion (including Sea Stores) to 31 March, 1888.	Name of Ship.
						UNPROTECTED SHIPS—*continued.*
£	£	£	£	£	£	Despatch Vessels —*continued.*
			167,178 *6,279*			Brought forward
						Paddle Despatch Vessels—
..	..	..	..	..	59,338 *15,692*	Enchantress (late Helicon).
						Yacht—
..	..	..	..	..	3,540 *891*	Imogene (purchased in 1884).
						Paddle Yachts—
..	..	..	..	..	309,380 *77,886*	Victoria and Albert.
..	..	..	..	..	119,690 *30,790*	Osborne.
						Special Service Steamers—
						Screw—
..	..	..	..	..	10,681 *2,737*	Vesuvius.
..	..	..	..	..	8,219 *2,219*	Seahorse.
..	..	..	..	..	2,400 *650*	Fire Queen (purchased in 1883).
..	..	..	42,213 *1,172*	..	3,545 *1,059*	Hearty (purchased in 1885).
..	..	..	25,265 *2,495*	..	1,963 *426*	Jackal (purchased in 1885).
						Paddle—
..	..	..	..	..	3,830 *563*	Sphinx.
						Paddle Small Steamers—
..	..	..	..	..	42,894 *10,760*	Harpy.
..	..	..	..	..	3,187 *762*	Cockatrice.
..	..	..	..	..	2,623 *813*	Alecto.
..	..	..	234,656 *9,946*	..	..	Cost of Despatch Vessels, &c., in each year, carried forward.

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STATEMENT

NAME OF SHIP.	1846–7.	1865–6.	1874–5.	1880–1.	1882–3.	1883–4.
UNPROTECTED SHIPS—*continued.*						
DESPATCH VESSELS—*continued.*	£	£	£	£	£	£
Brought forward.						
PADDLE DESPATCH VESSELS—						
Enchantress (late Helicon) . .	..	46,992 *10,666*	..	..	..	..
YACHT—						
Imogene (purchased in 1884)	..	..	..	..	..	18,023 *961*
PADDLE YACHTS—		1854–5.				
Victoria and Albert . .	..	136,441 *40,379*	..	..	..	..
Osborne . . .	..	..	105,919 *28,064*	..	..	..
SPECIAL SERVICE STEAMERS—						
Screw—						
Vesuvius. . .	..	. .	18,405 *3,435*	..	..	..
Seahorse . .	..	..	..	29,225 *645*	..	..
Fire Queen (purchased in 1883)	..	..	..	..	..	14,995 *547*
Hearty (purchased in 1885)	..	..	..	..	..	..
Jackal (purchased in 1885)	..	..	..	..	..	..
Paddle—						
Sphinx . . .	..	..	..	..	..	55,019 *1,261*
PADDLE SMALL STEAMERS—						
Harpy . . .	17,193 *954*	..	..	..	..	..
Cockatrice . .	..	..	..	32,381 *1,438*	..	..
Alecto . . .	..	..	..	..	33,336 *1,051*	..
Cost of Despatch Vessels, &c., in each year, carried forward .	£17,193 *954*	46,992 *10,666*	124,324 *31,499*	61,606 *2,083*	33,336 *1,051*	88,037 *2,769*

NOTE.—The Figures in *Italics* represent the Dockyard incidental charges apportioned to each ship.

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continued.

1884–5.	1885–6.	1886–7.	1887–8.	1888–9.	Cost after Completion (including Sea Stores) to 31 March, 1888.	Name of Ship.
						UNPROTECTED SHIPS—*continued.*
£	£	£	£	£	£	Despatch Vessels —*continued.*
			167,178 *6,279*			Brought forward
						Paddle Despatch Vessels—
..	..	..	..	..	59,338 *15,692*	Enchantress (late Helicon).
						Yacht—
..	..	..	..	..	3,540 *891*	Imogene (purchased in 1884).
						Paddle Yachts—
..	..	..	..	..	309,380 *77,886*	Victoria and Albert.
..	..	..	..	..	119,690 *30,790*	Osborne.
						Special Service Steamers—
						Screw—
..	..	..	..	..	10,681 *2,737*	Vesuvius.
..	..	..	..	..	8,219 *2,219*	Seahorse.
..	..	..	..	..	2,400 *650*	Fire Queen (purchased in 1883).
..	..	..	42,213 *1,172*	..	3,545 *1,059*	Hearty (purchased in 1885).
..	..	..	25,265 *2,495*	..	1,963 *426*	Jackal (purchased in 1885).
						Paddle—
..	..	..	..	..	3,830 *563*	Sphinx.
						Paddle Small Steamers—
..	..	..	..	..	42,894 *10,760*	Harpy.
..	..	..	..	..	3,187 *762*	Cockatrice.
..	..	..	..	..	2,623 *813*	Alecto.
..	..	..	234,656 *9,946*	..	..	Cost of Despatch Vessels, &c., in each year, carried forward.

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STATEMENT

NAME OF SHIP.	1846–7.	1854–5.	1855–6.	1863–4.	1865–6.	1866–7.	1867–8.	1873–4.	1874–5.	1875–6.
UNPROTECTED SHIPS—*continued.*										
DESPATCH VESSELS —*continued.*	£	£	£	£	£	£	£	£	£	£
Brought forward.	..	..	..	..	..	..	..	..	124,324 *31,499*	..
SURVEYING VESSELS—										
Sylvia . . .	..	..	..	..	..	44,446 *10,318*	..	..	..	..
Myrmidon . .	..	..	..	..	..	..	40,480 *10,474*	..	..	..
Egeria . . .	..	..	..	..	..	..	..	..	47,110 *9,120*	..
Rambler . . .	..	..	..	..	..	..	..	..	..	..
Triton . . .	..	..	..	..	..	..	..	..	..	..
Dart (purchased in 1882) . .	..	..	..	..	..	..	..	..	..	..
Stork	..	..	..	..	..	..	..	..	..	..
Research. . .	..	..	..	..	..	..	..	..	..	..
Total cost of Despatch Vessels, &c., in each year	£ 17,193 *954*	136,441 *40,379*	..	..	46,992 *10,666*	44,446 *10,318*	40,480 *10,474*	..	171,434 *40,619*	..
TROOP AND STORE SHIPS.										
Himalaya (purchased) . . .	..	130,000	..	..	..	..	..	..	..	..
Orontes . . .	..	..	..	124,117 *4,373*	..	..	..	..	..	..
Tamar. . . .	..	..	..	127,997 *5,185*	..	..	..	..	..	..
Wye (purchased).	..	..	..	..	..	..	..	21,500	..	..
Assistance . .	..	..	..	..	..	..	..	..	..	101,625 *2,507*
Humber (purchased in 1878)	..	..	..	..	..	..	..	..	..	..
Tyne (purchased in 1878) . .	..	..	..	..	..	..	..	..	..	..
Total cost of Troop and Store Ships in each year . .	£ ..	130,000	..	252,114 *9,558*	..	..	..	21,500		101,625 *2,507*

NOTE.—The Figures in *Italics* represent the Dockyard incidental charges apportioned to each ship.

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inued.

8–9.	1880–1.	1881–2.	1882–3.	1883–4.	1884–5.	1886–7.	1887–8.	1888–9. (*a*)	Cost after Completion (including Sea Stores) to 31 March, 1888.	Name of Ship.
										UNPROTECTED SHIPS—*continued.*
£	£	£	£	£	£	£	£	£	£	Despatch Vessels —*continued.*
..	61,606 *2,083*	..	33,336 *1,051*	88,037 *2,769*	..	..	..	..	..	Brought forward.
										Surveying Vessels—
..	..	..	..	..	..	..	..	..	54,395 *14,081*	Sylvia.
..	..	..	..	..	..	..	..	..	43,375 *10,946*	Myrmidon.
..	..	..	..	..	..	..	..	..	28,620 *8,035*	Egeria.
..	40,880 *1,583*	..	..	..	..	..	..	..	15,038 *3,733*	Rambler.
..	..	23,570 *733*	..	..	..	..	..	..	2,957 *783*	Triton.
..	..	..	15,229 *1,233*	..	..	..	..	..	3,072 *754*	Dart (purchased in 1882).
..	..	..	23,201 *948*	..	..	..	..	..	7,311 *2,024*	Stork.
..	..	..	..	..	..	..	..	26,783 *4,065*	..	Research.
..	102,436 *3,666*	23,570 *733*	71,766 *3,232*	88,037 *2,769*	..	167,178 *6,279*	67,478 *3,667*	26,783 *4,065*	.. £	Total cost of Despatch Vessels, &c., in each year.
										TROOP AND STORE SHIPS.
..	..	..	..	..	..	..	..	..	472,042 *118,346*	Himalaya (purchased).
..	..	..	..	..	..	..	..	..	350,123 *88,863*	Orontes.
..	..	..	..	..	..	..	..	..	294,793 *74,190*	Tamar.
..	..	..	..	..	..	..	..	..	40,488 *10,626*	Wye (purchased).
..	..	..	..	..	..	..	..	..	46,323 *12,108*	Assistance.
40,914 *298*	..	..	..	..	..	..	..	..	36,880 *10,044*	Humber (purchased in 1878).
82,164 *1,859*	..	..	..	..	..	..	..	..	48,906 *13,449*	Tyne (purchased in 1878).
23,078 *2,157*	..	..	..	..	..	..	..	..	..	Total cost of Troop and Store Ships in each year.

(*a*) The figures for this year represent the revised estimated cost of each vessel.

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STATEMENT showing the COST of CONSTRUCTION, REPAIRS apportioned to SHIPS during the

Appendix C. to the Report of the Select

YEAR.	EXPENDITURE FOR LABOUR AND CONSTRUCTION.				
	Dockyard-built Vessels.		Contract-built Vessels.		
	Armoured.	Unarmoured.	Armoured.	Unarmoured.	TOTAL.
1869-70 . .	536,293	259,906	540,055	50,793	1,387,047
1870-71 . .	558,800	264,052	455,415	52,547	1,330,814
1871-72 . .	345,750	448,074	349,288	41,060	1,184,172
1872-73 . .	237,956	413,878	61,869	95,384	809,087
1873-74 . .	377,715	615,128	8,244	288,941	1,290,028
1874-75 . .	710,236	372,023	31,928	413,974	1,528,161
1875-76 . .	759,495	289,606	298,968	265,149	1,613,218
1876-77 . .	604,607	497,506	335,711	684,136	2,121,960
1877-78 . .	408,433	421,897	1,540,039	552,073	2,922,442
1878-79 . .	372,679	353,504	258,516	523,350	1,508,049
1879-80 . .	528,471	363,932	103,253	392,951	1,388,607
1880-81 . .	648,017	309,475	50,781	418,076	1,426,349
1881-82 . .	938,641	342,232	10,672	390,955	1,682,500
1882-83 . .	961,151	381,010	29,559	395,294	1,767,014
1883-84 . .	1,127,377	436,507	132,760	233,446	1,930,090
1884-85 . .	1,283,899	427,578	233,828	296,765	2,242,070
1885-86 . .	990,833	613,785	887,281	1,245,562	3,737,461
1886-87 . .	1,163,742	384,968	1,240,938	705,577	3,495,225

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and MAINTENANCE, and INCIDENTAL CHARGES of the DOCKYARDS Years 1869–70 to 1886–87.

Committee on Navy Estimates, 1888.

MATERIALS ON			TOTAL EXPENDITURE ON SHIPS.			TOTAL AMOUNT EXPENDED UNDER VOTE.	
REPAIR AND MAINTENANCE.							
Armourd.	Unarmourd.	TOTAL.	Direct — For Labour and Materials, including Payments to Contractors, &c.	Indirect — For Dockyard Incidental Charges.	TOTAL.	Votes 6 and 10, for Labour and Stores, &c.	Navy Votes.
130,743	446,549	577,292	1,964,339	491,104*	2,455,443	2,572,745	10,102,641
182,065	487,551	669,616	2,000,430	499,902*	2,500,332	2,635,076	10,087,414
87,595	397,342	484,937	1,669,109	436,102	2,105,211	2,545,865	9,875,981
158,933	386,983	545,916	1,355,003	416,888	1,771,891	2,413,347	9,564,678
291,381	524,601	815,982	2,106,010	483,398	2,589,408	3,175,631	10,558,751
320,229	672,570	992,799	2,520,960	490,419	3,011,379	3,455,650	10,776,277
321,871	631,806	953,677	2,566,895	530,179	3,097,074	3,540,092	10,903,924
207,446	600,210	807,656	2,929,616	509,973	3,439,589	3,929,846	11,259,835
489,182	580,243	1,069,425	3,991,867	521,034	4,512,901	5,123,591	12,800,044
480,077	634,074	1,064,151	2,572,200	566,516	3,138,716	3,810,737	11,959,139
331,033	491,187	822,220	2,210,827	529,493	2,740,320	3,106,563	11,004,394
259,987	581,723	841,710	2,268,059	522,933	2,790,992	3,082,803	10,513,469
212,288	478,792	691,080	2,373,580	513,773	2,887,353	3,318,555	10,870,922
321,979	555,718	877,697	2,644,711	524,948	3,169,659	3,472,953	12,063,210
266,497	659,682	926,179	2,856,269	549,442	3,405,711	3,615,264	10,758,594
328,270	686,543	1,014,813	3,256,883	572,402	3,829,285	3,861,333	11,625,809
335,222	651,671	1,691,019†	5,428,480	593,891	6,022,371	7,188,536	16,193,701
305,865	608,258	914,123	4,409,348	548,845	4,958,193	5,505,568	13,118,657

* These amounts are based upon the average indirect expenses for 1871–72 and 1872–73.
† Includes £704,126 for hire and fitting out of armed cruisers, &c.

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STATEMENT showing the Average RATES of PAY and PAY Rank of Rear Admiral, provided for in VOTE 1 of

Appendix, No. 3, to the Report of the

COMMISSIONED OFFICERS.	1874–75.		
	Number.	Average Rate per Annum.	Amount.
		£	£
EXECUTIVE AND NAVIGATING:			
Commodore, 2nd Class	3	1,388·0	4,164
Captain	80	732·61	58,609
Commander	110	401·09	44,120
Lieutenant	469	205·31	96,292
Sub-Lieutenant	343	91·25	31,298
Staff Captain	3	558·33	1,675
Staff Commander and Navigating Lieutenant	155	300·81	46,626
Navigating Sub-Lieutenant	109	146·85	16,007
Chief Officer	10	200·8	2,008
Senior Mate of Cruiser	12	108·83	1,306
Chief Gunner Chief Boatswain	22	164·22	3,613
ENGINEER OFFICERS:			
Chief Inspector of Machinery	3	492·66	1,478
Inspector of Machinery	3	474·66	1,424
Fleet, Staff, and Chief Engineer	126	323·68	40,784
Engineer	618	179·23	110,766
Assistant Engineer	162	119·02	19,282
CHAPLAINS, &C.:			
Chaplain	51	256·57	13,085
Chaplain and Naval Instructor	20	387·25	7,745
Naval Instructor	29	251·34	7,289
MEDICAL OFFICERS:			
Inspector-General of Hospitals and Fleets	..	..	..
Deputy ditto ditto	..	..	..
Fleet Surgeon	41	506·53	20,768
Staff Surgeon	91	369·22	33,599
Surgeon	189	221·49	41,862
SECRETARIES:			
Secretary	17	388·29	6,601
ACCOUNTANT OFFICERS:			
Fleet and Staff Paymaster, and Paymaster	118	423·26	49,945
Assistant Paymaster	238	146·49	34,866
ARTIFICER OFFICER:			
Chief Carpenter	9	164·77	1,483
	3,013	..	696,695

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ALLOWANCES of each Class of OFFICER in the ROYAL NAVY below the the NAVY ESTIMATES for the Years 1874–75 and 1888–89.

Select Committee on Navy Estimates, 1888.

1888–89.			Numbers, 1888–89.		Amount, 1888–89.		REMARKS.
Number.	Average Rate per Annum.	Amount.	More.	Less.	More.	Less.	
	£	£			£	£	
2	1,340·5	2,681	..	1	..	1,483	These average rates are exclusive of certain Special Allowances paid for extra duties in individual or exceptional cases. See pages 28–33 of Navy Estimates for 1888–89.
86	713·76	61,384	6	..	2,775	..	
109	399·54	43,550	..	1	..	570	
767	234·48	179,846	298	..	83,554	..	
173	102·97	17,815	..	170	..	13,483	
5	555·2	2,776	2	..	1,101	..	
100	353·34	35,334	..	55	..	11,292	
	Rank now extinct.		..	109	..	16,007	
19	211·94	4,027	9	..	2,019	..	
10	127·7	1,277	..	2	..	29	
27	164·25	4,435	5	..	822	..	
3	693·66	2,081	..	..	603	..	
1	602·0	602	..	2	..	822	
204	344·4	70,258	78	..	29,474	..	
191	201·58	38,503	..	427	..	72,263	
234	139·33	32,605	72	..	13,323	..	
41	256·56	10,519	..	10	..	2,566	
33	377·73	12,465	13	..	4,720	..	
13	292·31	3,800	..	16	..	3,489	
..	..	..	..	..	..	..	
..	..	..	..	..	..	..	
38	549·6	20,885	..	3	117	..	
72	422·72	30,436	..	19	..	3,163	
198	238·87	47,298	9	..	5,436	..	
17	419·53	7,132	..	..	531	..	
138	415·01	57,272	20	..	7,327	..	
176	155·33	27,338	..	62	..	7,528	
14	165·57	2,318	5	..	835	..	
2,671	..	716,637	517	877	152,637	132,695	
			..	360	19,942	..	

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STATEMENT showing the Average RATES of PAY and PAY
Rank of Rear Admiral, provided for in VOTE 1 of

From Report of Select Committee

SUBORDINATE OFFICERS.	1874–75.		
	Number.	Average Rate per Annum.	Amount.
		£	£
EXECUTIVE BRANCH:			
Midshipman	371	31·94	11,849
Naval Cadet	123	10·05	1,236
Second Mate	14	74·93	1,049
Navigating Midshipman	58	70·0	4,060
Navigating Cadet	3	18·33	55
ACCOUNTANT BRANCH:			
Clerk	29	73·0	2,117
Assistant Clerk	5	45·6	228
	603	..	20,594
WARRANT OFFICERS.			
Gunner, and Boatswain	685	117·25	80,319
Carpenter	198	119·19	23,601
	883	..	103,920
COASTGUARD ON SHORE.			
COMMISSIONED OFFICERS:			
Commander	52	365·0	18,980
Lieutenant	14	182·5	2,555
Staff Commander, and Navigating Lieutenant	7	182·5	1,278
Chief Officer (late of Cruiser)	3	182·5	548
Paymaster	11	521·91	5,741
Senior Mate	7	146·0	1,022
	94	..	30,124
WARRANT OFFICERS.			
Gunner	1	137·0	137
Chief Officer	219	109·5	23,980

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ALLOWANCES of each Class of OFFICER in the ROYAL NAVY, below the the NAVY ESTIMATES for the Years 1874–75 and 1888–89.

on Navy Estimates, 1888.

1888–89.			Numbers, 1888–89.		Amount, 1888–89.		REMARKS.
Number.	Average Rate per Annum.	Amount.	More.	Less.	More.	Less.	
	£	£			£	£	
260	31·94	8,304	..	111	..	3,545	These average rates are exclusive of certain Special Allowances paid for extra duties in individual or exceptional cases. See pages 28–33 of Navy Estimates for 1888–89.
52	18·25	949	..	71	..	287	
230	Without Pay.	..	230	..	No Pay.	..	
14	91·29	1,278	..	..	229	..	
} Ranks now extinct.			..	58	..	4,060	
			..	3	..	55	
42	73·57	3,090	13	..	973	..	
22	45·59	1,003	17	..	775	..	
620	..	14,624	260	243	1,977	7,947	
			17	..	..	5,970	
734	128·17	94,093	49	..	13,774	..	
190	129·95	24,692	..	8	1,091	..	
924	..	118,785	49	8	14,865	..	
			41	..	14,865	..	
31	365·0	11,315	..	21	..	7,665	These average rates are exclusive of certain Special Allowances paid for extra duties in individual or exceptional cases. See page 34 of Navy Estimates for 1888–89.
38	255·5	9,709	24	..	7,154	..	
..	..	..	..	7	..	1,278	
12	182·5	2,190	9	..	1,642	..	
11	593·63	6,530	..	..	789	..	
1	146·0	146	..	6	..	876	
93	..	29,890	33	34	9,585	9,819	
			..	1	..	234	
1	151·0	151	..	..	14	..	
227	109·5	24,856	8	..	876	..	

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SHIPS which will be probably removed from the LIST of the NAVY as obsolete, or not worth repair, in the period between 1st of April, 1889, and 1st of April, 1894. (Parliamentary Paper 1889.)

Class of Ship.	Displacement. Tonnage.	Indicated Horse Power.	Name.
Battle Ships, 3rd Class	6,270	2,540	Defence.
	6,710	3,350	Valiant.
	9,210	5,270	Warrior.
	6,710	3,260	Hector.
			Four.
Cruisers, Unprotected, 2nd Class	6,250	7,480	Shah.
Cruisers, Unprotected, 3rd Class	2,120	2,190	Opal.
	2,120	2,000	Tourmaline.
	2,120	1,990	Turquoise.
	2,120	1,830	Ruby.
	2,120	2,170	Emerald.
	2,120	2,000	Garnet.
	1,970	2,140	Diamond.
			Seven.
Sloops, Unprotected	1,130	1,090	Wild Swan.
	1,130	1,110	Penguin.
	1,130	1,010	Osprey.
	1,130	950	Cormorant.
	1,130	1,010	Dragon.
	1,130	970	Pegasus.
	1,130	1,020	Miranda.
	240	920	Daring.
			Eight.
Gun Vessels, 2nd Class	835	760	Ranger.
	835	810	Algerine.
	780	720	Falcon.
	610	890	Ready.
			Four.
Gunboats, 2nd Class	455	510	Firm.
	455	480	Forester.
	455	460	Firebrand.
	455	470	Firefly.
	438	530	Zephyr.
	430	430	Merlin.
			Six.
Total No.	..	..	Twenty-nine.

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XI.

Report of the Committee on the French Navy Estimates for 1889.

By M. GERVILLE-RÉACHE, *Member of the Chamber of Deputies.*

I.

Navy Estimates for 1889.

The Credits demanded by the Naval Department with a view to provide for the Expenditure of the Fleet in 1889 are as follows :—

Ordinary	£7,706,444
Extraordinary . . .	571,920
Old materials . . .	60,000
Total . . .	£8,338,364

The proposed Expenditure for 1889 shows an excess over the previous year amounting to £229,256.

The Votes proposed for the year 1889 show an excess over the Expenditure upon the Navy in the most prosperous years. Deducting the War Expenditure, the Votes for the Navy were as follows :—

In 1880	£7,423,183
In 1881	7,567,913
In 1882	7,898,802
In 1883	8,197,840

The Commission on the Navy Estimates invited the attention of the Minister of Marine to the increasing scale of expenditure in his Department, as proposed in the Scheme submitted to Parliament.

The Minister stated in reply that the Commission investigated his Estimates from a different point of view from that which he himself occupied. While he aimed to make good the maritime defences of the country, it was the primary aim of the Commission to effect economies in the spending Department.

If we may draw any inference from the debates which have from

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time to time taken place in Parliament on the subject of the Navy since the July Government, there is reason to fear that successive Ministers of Marine have shown a comparative indifference with respect to their administrative duties. The responsibility for this state of things does not rest wholly with Ministers; it lies rather with the legislative authority, which has never devoted serious attention to the due distribution of official duties and functions.

Position of the First Lord of the Admiralty in England.

The English Legislature has been more far-seeing, and has determined with precision the duties of the First Lord of the Admiralty, and the authority with which he is invested. The fundamental law which establishes the appropriate functions of the office of First Lord is set out in an old Table dating from the fourteenth century. In this document it is stated, "That the Ministers are to direct and to superintend their departments, and to deal with all the political and administrative questions connected with their office. They are responsible for promotions, the award of honorary distinctions, the appointment of civil functionaries, the selection of officers to command ships and squadrons; and they are charged with the conservation of the river Mersey." This distribution of duties, maintained in all particulars save the last mentioned down to our own day, was further developed by arrangements explained by Lord Beaconsfield in the House of Commons on the 13th March, 1876, on the occasion of a debate on the Estimates.

Lord Beaconsfield's explanations.

The noble Lord spoke as follows:—"The Minister of Marine is responsible to Parliament for the amounts voted under the Naval Estimates. He deals with all political and administrative questions connected with the Fleet. He is responsible for the distribution of squadrons and ships, and for all the decisions which may from time to time be taken in connection with this subject. He is responsible for the good management of dockyards and storehouses, in which are employed from fifteen to twenty thousand men. It is his duty to take care that the money voted by Parliament shall be expended as profitably and economically as possible."

Position of the Ministers of Marine in France.

It results from this enumeration that in England the main duties of the First Lord of the Admiralty are of an administrative character. In France, the ministerial functions, not having been fixed with precision by an Act of Parliament, have been variously exercised according to the temperament and the personal tastes of successive Ministers. In France, where the rule is different from that which obtains in England, the French Ministers of Marine, holding a high rank in the Navy, have been naturally disposed to consider themselves as commanders-in-chief of the forces afloat.

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Results of the French system.

One Minister, relying on his knowledge of naval architecture, has taken upon himself duties which properly belong to the Council of Construction. Another, with equal confidence in his own professional knowledge, has pronounced authoritatively on some question of naval tactics, without caring to consult his naval advisers.

Thus it has happened that the unity and consistency of view which might have been secured by boards of experts sitting permanently has been more or less lost from the changeable and sometimes contradictory views of successive Ministers. The result has been to lay increasing burdens upon the Treasury, without any corresponding advantage to the Navy.

A cherished tradition.

This idea that the Minister is the chief of the Navy is a cherished tradition in the Sea-service. The treatise on the Administration of the Navy, written by Commissary-General Fournier, defines the Minister of Marine as "the Chief, the superior officer, in the hierarchy of the Navy." It is evident that this conception is unconstitutional. The Minister of Marine is no more the Chief of the Sea-service than is the Minister of War the Chief of the Army. The one and the other are nothing more than the administrators of their respective Departments. As the head both of the Army and of the Navy, the Chief of the State can delegate his power of command either to the Minister, as the administrative head, or to the Commander-in-Chief. Instances are not wanting of the results which may follow from the false conception which has been entertained.

What happened in 1870.

In 1870, the then Minister of Marine being desirous of taking the chief command of the squadron sent to the North Sea, the movements of ships in the Port of Cherbourg were most seriously hampered, while the vessels of the German Navy were able with impunity to leave the coasts of England and to return to the Baltic Ports.

We see the consequences of the theory to which we have referred in the excessive concentration of the control of naval affairs in Paris, and in the weakening of the responsibilities which properly belong to the Boards of technical advisers.

Consultative Board of Admiralty necessary.

In our view, it is desirable to go further on the lines upon which the Department has already begun to move. The proper duties which belong to each individual must be clearly defined and firmly insisted upon. It is necessary to have a strong permanent staff for the careful study of naval questions. It is necessary to have a consultative Board at the Admiralty to which every Legislative proposal, every measure relating to the naval defences of France, or

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the organisation of any branch of the service, should be referred. It is necessary to have a Minister to deal with the resources placed at his disposal by the Parliament, with the view to combine in the highest attainable measure economy with efficiency.

Reorganised on the lines thus suggested, the Department will certainly make the expenditure of the Estimates more effective, and will command more readily that mutual confidence which it is so necessary to maintain between the administrative services and the Parliament.

Statement of mismanagement.

The fact that the Ministers have treated their administrative duties as of secondary importance has had prejudicial consequences on the conduct of the naval affairs. Genius has not unfrequently been displayed in initiating improvements in organisation. In all branches of the service men of exceptional ability have been found. In the practical execution of duties many failures have been seen. There has been want of system in the negotiation of contracts, and a laxity in their performance. We have seen efforts made to spend all the money voted by the Houses of Parliament with the most reckless indifference as to the result. We have seen an excessive accumulation and consequent deterioration of stores, and a defective organisation of labour in the ports. Estimates have been imperfectly prepared, and the accounts of Expenditure have been inaccurate. We shall give proof of the assertions we make by quoting facts. This done, we shall examine the relative position of the French Fleet side by side with the principal navies of Europe. We shall examine the organisation of the naval defences of France. We shall compare the Estimates of the French and foreign navies.

[N.B.—Lengthy sections of the Report are here omitted dealing with the mode of putting out ships to contract, with the undue anxiety to spend fully all the money voted for the Navy in Parliament, the excessive accumulation and deterioration of stores, the defective organisation of labour in the dockyards, and with other kindred subjects. The faults with which French naval administration is charged are similar in kind to those of which we hear in England. We have certainly nothing to lose by a comparison of results with France.]

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II.

Comparison of the French Fleet with the Principal Fleets of Europe.

[*N.B.*—*See pp.* 66 et seq. *of the French Official Report.*]

Attention must not be confined to the administrative questions which have been considered in the previous section of this report. The necessary standard of strength for our fleet, and the condition of our maritime defence generally, are subjects of yet more grave importance.

Lord Charles Beresford's Parliamentary Return.

We shall not attempt to reconstruct the very complete table presented to the House of Commons on the 17th May, 1886, on the motion of Lord Charles Beresford, giving a detailed enumeration of the fleets of England, France, Russia, Italy, Austria, and Germany. It will, however, be useful to put before the country a comparison of the principal navies of Europe, with a view to establish the necessity for the heavy burdens laid upon the taxpayer for the maintenance of the fleet.

French Navy requirements.

The standard of strength which it would seem desirable to maintain for the French Navy should be such as to make our fleet equal in numbers to the two most powerful navies of continental Europe, observing that in England it is considered necessary to maintain a fleet superior to a combination of any two of the Continental navies. Unhappily we are very far below the standard we have laid down for ourselves. Our weakness is to be attributed partly to the misuse of resources, to which we have already called attention, and partly to the limitation upon naval expenditure, to which we are bound to submit in view of the more urgent necessity for strengthening our army.

England possesses at the present time 383 vessels, completed and capable of rendering service with the fleet. France has 191 ships; Russia, 185; Italy, 152; Germany, 139; Austria, 84, with 3 vessels in process of being built. The total numbers which we have given may be classified as in table on p. 628.

Additions to the list of ships building and completing.

We have to complete the table by adding vessels building and completing. To a certain extent, though by no means sufficiently, the work in progress will fill up the gaps and deficiencies in our list of ships. The vessels in course of construction are 93 in France, 44 in Italy, 31 in England, 27 in Germany, 8 in Russia, 7 in Austria. Some doubt exists as to the accuracy of the figures

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		England.	France.	Russia.	Italy.	Germany.	Austria.
Ironclads. . .	Old types . .	25	8	2	3	..	..
	Recent types .	13	7	..	4	..	..
		38	15	2	7	..	..
Belted Cruisers .	Old types . .	3	5	..	4	..	..
	Recent types .	2	4	..	..	..	..
		5	9	..	4	..	..
Armoured Coast Defence Vessels	Old types . .	10	4	9	4	..	..
	Recent types .	4	6	..	..	..	..
		14	10	9	4	..	..
Cruisers . . .	Old types . .	41	43	16	8	..	..
	Recent types .	36	..	8	5	..	..
		77	43	24	13	..	..
Armoured Gunboats		2	2	13	..	..	..
Unarmoured Gunboats and Sloops		86	30	20	13	..	..
		88	32	33	13	..	..
Torpedo Cruisers		12	3	2	2	5	6
Torpedo Gunboats		5	5	..	3	4	1
Sea-going Torpedo boats and Torpedo Scouts		61	7	24	40	49	12
Torpedo boat Chasers and Torpedo boats of various classes . . .		82	67	91	65	26	37
Special Transports to accompany the squadrons or Torpedo boats		1	..	..	1	1	..

which we have given, especially for Russia and Austria. The list may be classified as at head of p. 629 :—

Additions on account of the programmes of ship-building of 1889.

To complete our list, in so far as the information at our disposal with reference to the programme of construction for 1889 enables us to do so, we have the following comparison for the several naval

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	France.	Italy.	England.	Germany.	Russia.	Austria.
Ironclads	8	6	7	1	6	2
Cruisers	14	2	13	3	2	2
Armoured Gunboats	6	..	..	..	..	..
Unarmoured Gunboats	..	4	10	..	..	..
Torpedo Cruisers	1	7	1	1	..	1
Torpedo Gunboats	3	..	..	2	..	2
Sea-going Torpedo Boats and Torpedo Scouts	11	25	..	19	..	..
Torpedo Boat Chasers and Torpedo Boats of various classes	50	..	..	..	..	..

Powers. England will lay down 46 vessels; France, 10; Russia, 9; Italy, 7; Germany, 5; and Austria, 1. Below is a classified list:—

	England.	France.	Russia.	Italy.	Germany.	Austria.
Ironclads	..	1	1	..	..	..
Cruisers	15*	1	8	1	1	..
Unarmoured Cruisers and Sloops	6	..	..	2	..	..
Torpedo Cruisers	8†	2	..	4	1	..
Sea-going Torpedo Boats and Torpedo Scouts	6	5	..	..	..	..
Torpedo Chasers and Torpedo Boats of various classes	10	..	..	..	..	..

It results from the three tables which we have given, that as regards the number of our ironclads we are up to the standard we have laid down for the French Navy. We regret that we are in a much less satisfactory position in the several classes of cruisers, torpedo-cruisers, torpedo-sloops, sea-going torpedo-boats, and torpedo-boats.

Satisfactory as to ironclads; not so as regards other vessels.

The effective strength of the fleet being thus indicated, it is truly surprising to find that the naval estimates are burdened with charges which may rather be regarded as expenditure for poor relief, or as expenditure for giving a stimulus to the private trade of our naval ports. Not less surprising is it to see works undertaken, from which,

Provisions in Navy Estimates devoted to other objects than providing ships.

* Of these 5 are intended for Australia.
† Of these 2 are intended for Australia.

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as it is stated by the Minister, no useful result is to be anticipated within a period of eight or ten years. On this subject frequent representations have been made to the naval administration by those charged with the supervision of administration on behalf of Parliament. For several successive years the Commissions appointed to examine the Navy estimates have insisted on the necessity of raising the fleet to a proper standard of strength. They have specially insisted on a large addition to the number of our fast cruisers and our torpedo-boats.

Subsidies to steam-ship companies.

In this connection we have a suggestion to offer. Subsidies are paid from the Navy estimates to steam-ship companies, whose vessels will certainly be available in the event of war as useful cruisers for the fleet. There is no reason why a law should not be passed, which would authorise the construction of these large steam-ships, some of which are remarkable for their speed, under the control of the Admiralty. They might be fitted to receive an armament, and be made capable of being rapidly converted into ships of war. This plan has already been adopted in England. The Peninsular and Oriental, and the Inman and International Companies have recently added to their fleets several fast ships constructed so as to be available in time of war as auxiliary cruisers.

English practice.

Those vessels counted only which are of service with the fleet.

In the figures given on pp. 628, 629 those vessels only are included which are capable of service with the fleet. Several, condemned as unfit for service, have been omitted. Adopting, with a view to comparison, the tabulation of the report of the estimates of 1886, we now proceed to give a comparative statement of the navies of Europe. Sloops of the second and third class and armed launches are included, although vessels of these classes would be of little use in European war. The differences between the enumeration of 1885 and that of 1886 result from the removal of ships from the lists, from the completion of a few vessels for service, and from the re-classification of vessels classified as of recent type in 1880–85, but which are now obsolete.

French classification adopted.

The French classification has been adopted as a basis, without reference to the various systems adopted for the classification of their ships by other Powers. Thus it is that certain British sloops are classified as third-class cruisers, that Austrian ironclads are reckoned as belted-cruisers, being similar in point of fighting efficiency to our own vessels, and that the fast sloops of the German navy are classed with our torpedo-cruisers.

A few unimportant discrepancies which may be found, as between the figures given on pp. 628, 629 and those on pp. 640–643, result from some difference in classification and from information recently made public.

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In the comparison of speed with the ships of other powers the results of our investigations are unsatisfactory. We will endeavour to give the exact figures. And first we give the speeds of foreign ships completed or in progress, as enumerated in the table supplied to an order of the House of Commons on the 9th March, 1886. We take only those vessels with a speed of fourteen knots and over.

	England.	Italy.	Germany.	Austria.	Russia.
IRONCLADS.					
14 knots	..	..	9	3	1
Over 14 knots	10	..	..	..	..
15 knots	..	2	1	..	1
Over 15 knots	15	..	..	..	..
16 knots	..	3	..	..	..
Over 16 knots	5	..	..	..	..
17 knots	7	..	..	..	..
Over 17 knots	1	..	..	..	..
18 knots	..	2	..	..	..
CRUISERS.					
Over 14 knots	3	..	..	..	..
15 knots	..	4	4	..	..
Over 15 knots	4	..	..	..	..
16 knots	..	..	1	..	..
16 to 17 knots	6	..	..	..	..
17 knots	..	5	..	..	..
18 knots	11	..	2	..	..
TORPEDO CRUISERS.					
16 knots	2	..	2	..	..
16 to 17 knots	8	..	..	..	..
Over 17 knots	1	..	..	..	..
18 knots	..	..	..	3	..
19 knots	..	1	..	..	..
20 knots	..	5	..	..	1
TORPEDO BOAT CHASERS AND TORPEDO SLOOPS.					
Over 14 knots	..	..	..	..	..
15 knots	2	..	15	..	..
15 to 16 knots	..	..	..	..	..
16 knots	..	..	2	..	..
17 knots	..	..	..	..	1
18 knots	..	..	..	3	..
19 knots	4	19	..	..	..
20 knots	..	5	..	..	..
TORPEDO BOATS.					
14 to 15 knots	9	..	..	..	..
15 to 16 knots	49	..	..	..	..
16 knots	1	..	..	..	..
16 to 19 knots	19	..	..	..	..
19 knots	59	..	..	..	..
20 knots	1	..	..	..	..
22 knots	1	..	..	..	..

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Speeds of ships.

The English return, showing the speed of the faster ships of foreign navies, is already out of date. It does not include a certain number of ships of the most recent types, and does not give the speeds attained in the latest trials. For Italy the English return does not give the exact speeds of the following vessels.

Ironclads	Ruggiero de Lauria	16 to 17 knots
	Andrea Doria	" "
	Francesco Morosini	" "
Cruisers	Barbarigo	18 knots
	Giovani Bausan	17·5 knots
	Dogali	16 to 18 knots
	Savoia	17 knots
	Americo Vespuci	17 "

In the case of Germany the English document gives rates of speed which are sometimes inferior to the reality. Thus:—

		Speed quoted.	Actual speed.
Ironclads	Wurttemburg	14 knots	14·8 knots
	Deutschland	14 "	15·5 "
	Kronprinz	14 "	14·3 "

The speed of the torpedo-boats is not given. They are as follows:—

1 of 17 knots
7 " 18 "
140 " 19 to 20 knots.

For Austria also the English return gives speeds which are less than those actually obtained. Thus:—

		Speed quoted.	Actual speed.
Torpedo Cruisers	Panther	18 knots.	18 to 19 knots
	Leopard	18 "	" "
	Lussiu	14 "	15 knots.

No mention is made of the Meteor, which steams 23 knots, or of the Miramar,* which steams 17 knots. Austria has, in addition, torpedo-boats, like the Falka, which steam 22 knots.

The English speeds, as given in Lord Charles Beresford's table, are frequently inferior to the speeds as given in the newspapers at the date of the trials. We may probably conclude that the speeds as given in the newspapers were realised with a draught of water less than the mean load draught, while the speeds given by the Admiralty must be taken as those obtained at the mean load draught.

We may give a few examples. The newspapers give the speeds of 17·5 knots for the Benbow and 16·84 for the Colossus. The official return gives for the Benbow a speed of 17 knots and for the Colossus a speed of 15·4 knots.

We learn from the memorandum of the First Lord of the Admiralty on the programme for 1888–9 that it will be the aim

* The Imperial yacht (paddle).

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of the Board of Admiralty to build an increasing proportion of vessels with the highest attainable speeds.

No new ironclad laid down in England in 1888–9.

The British Admiralty determined to lay down no new iron-clad in 1888–9. Their decision was doubtless due to the fact that the English fleet has more iron-clads than any two foreign navies combined. On the other hand, it was decided to lay down two cruisers, superior in speed and coal-endurance, protection and armament, to anything which has been attempted up to the present day.

[N.B.—The report proceeds to give details of the dimensions and armament of the Blake, Blenheim, and Vulcan, which it is not necessary to repeat. They are fully given in the tables in Part II.]

If we now examine the speeds attained by French ships, exceeding 14 knots, we have the following results :—

Ironclads of 14 knots	2
„ over 14 knots	7
„ of 15 knots	2
„ „ 15·2 knots	3
„ over 15·2 knots	1
Cruisers of 14 knots	8
„ „ 14·7 knots	1
„ „ 15 „	7
„ „ 16 „	2
„ „ 16·7 „	1
„ „ 17 „	2
„ „ 18 „	1

Our torpedo boats have a speed of from 17 to 20 knots.

The estimated speeds for the ships now building are as follows :—

Ironclads	of 15 knots	1
„	„ 15·18 „	1
„	„ 16·2 „	4
„	„ 18 „	1
Cruisers	„ 18 „	1
„	„ 19 „	5
„	„ 19·5 „	6
„	„ 20 „	3
Torpedo Sloops or Torpedo Gunboats, and Torpedo Scouts	„ 18 „	3
„	„ 20·5 „	1
„	„ 25 „	1

The estimated speeds for the ships to be laid down are as follows :—

Cruisers of 18 knots	2
Torpedo Sloops or Torpedo Gunboats of 18 knots	2
Sea-going Torpedo Boats of 18 knots	5

It results from these statistics, to say the least, that we were late in commencing, and are making but slow progress in the construction

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Results of comparison of relative number of ships.

of, ships of high speed. The naval department seems now at length to appreciate the necessity of not constructing any vessel which has not the highest speed attainable by any of its own particular type.

* * * * * *

Success in the naval warfare of the future will depend most certainly on the valour of the crews and the armament of the ships, and, with equal speeds, on the offensive and defensive power; but it will essentially depend on the greater or less speed, whether in engagements between fleets or between single ships.

* * * * * *

All future vessels should have great speed.

We repeat that all vessels, to be henceforward laid down, and intended for any description of naval service other than that of the rivers in our colonies, should be of the highest attainable speed. A vessel of slow speed or inferior speed, it cannot be too often repeated, is at the mercy of an adversary.

Ships of all classes required by France.

With regard to types of ships generally, in view of the varied exigencies of our political situation, it is our duty to have ships of all classes. To meet the possible contingencies of naval warfare in the Mediterranean ironclads are essential. For service in the Atlantic, in the Channel, in the North Sea, and on our own coasts, we require cruisers, gunboats, coast defence ships and torpedo-boats; but whether they be ironclads, gunboats, coast defence ships, scouts or torpedo-boats, let us not lay down a single vessel of less than 18 knots speed.

[This section of the report concludes with a well-merited compliment to the personnel of the French Navy.]

III.

Comparative View of Naval Estimates for France and certain Foreign Countries.

Report of Committee continued.

It has seemed to us that it would be useful and interesting to institute a comparison between the amounts voted for naval services in the past four years, the sum voted for the current year, and the amount proposed for 1889.

French Navy Estimates,

The tabular statement which we have prepared and which will be be found in Part IV., gives the following results. Deducting the subsidy formerly granted to the Establishment of the Invalides, the amount voted for the Navy was :—

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In 1884.	£7,791,663
In 1885.	7,854,482
In 1886.	7,636,681
In 1887.	8,226,785

[The total for 1887 includes the extraordinary as well as the ordinary expenditure]. French Navy Estimates.

In 1888.	£7,810,888
In 1889.	8,049,324

We will now proceed to give a comparative statement of the Naval Estimates of foreign powers.

ENGLAND.

Navy Estimates for 1883 . . .	£13,192,240
„ „ 1886–7 . . .	14,400,000
„ „ 1888–9 . . .	13,080,000

English Navy Estimates.

In 1889 there is an additional expenditure of £450,000 for the special squadron for service on the Australian station, making a total of £13,530,000. There is thus an apparent increase over 1887–88; but when various adjustments have been made, there is an actual reduction of £905,586.

The French Navy Estimates for 1888, deducting £245,160 for the subsidy to the Invalides, amount to £7,810,908.

The English Navy Estimates for 1887–88 amount to £13,160,000.

To make a fair comparison, we must deduct from the French Estimates the expenditure for the defence of the colonies, £734,320; the expenditure for guns, £404,240; the charge for transport of troops, £360,000; and certain charges for police services. The total sum to be deducted is £1,609,360. Calculated on the same basis as the English, the French Navy Estimates should be taken at the reduced sum of £6,201,548. Deductions for comparison.

Turning to the English Navy Estimates, the deductions to be made, for the purpose of comparison, include:—

Pensions, civil and military . . .	£1,236,180
Transport of troops	207,000
	£1,443,180

Calculated on the same basis as the French, the English Navy Estimates must be taken at £11,716,820.

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Russia.

The following table shows the expenditure on the Russian Navy :—

1882	£2,881,573
1883	3,118,858
1884	3,502,189
1885	3,672,000
1886	3,920,000
1887	3,600,000

Russia maintains no force similar to the French Marine Infantry. The only naval stations are those of the Baltic, the North Sea, the Levant, the Black Sea and China.

As in Italy and Germany, so in Russia, no charge is laid upon the Navy Estimates for the defence of the colonies or for pensions to seamen. For the purposes of comparison, the French Navy Estimates may be taken at £6,201,548, and the Russian Estimates at a total of £3,577,600, or a difference of £2,623,948.

Italy.

Including the extraordinary expenditure the total amount of the Naval Estimates for 1883 was £2,287,200. For the succeeding years the expenditure of the Italian Navy is shown in the following table :—

1884–85	£2,311,680
1885–86	3,074,800
1886–87	3,768,720
1887–88	4,095,400

On the 29th of May, 1887, an extraordinary credit of £3,400,000 was granted to the Government; the charge to be spread over ten years, but the additional construction sanctioned, to be pushed forward with all due despatch. Adding to the amount voted under Ordinary Estimates the sums, provided out of the special credit to which we have referred, the total expenditure of the Italian Navy for 1887 and 1888 amounted to £4,728,080, of which £3,663,440 may be classed as ordinary, and £1,064,640 as extraordinary.

For 1888–89 the Navy Estimates as originally proposed, amounted to—

Ordinary expenditure	£3,653,040
Extraordinary expenditure	774,400
or a total of	£4,427,440

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On the 23rd of February, 1888, the Minister of Marine made a proposal for a further extraordinary expenditure, amounting to £517,040. Adding this further supplementary sum to the Navy Estimates as orginally presented, the expenditure on the Italian Navy for the year 1888–9 amounted to £4,916,240, of—

Ordinary expenditure	£3,773,840
Extraordinary expenditure . . .	1,142,400

Deducting certain items for services not directly connected with the fleet, the total expenditure upon the Navy may be taken at £4,449,400.

Italy does not maintain a force of cruisers. No colonial establishments are kept up, with the exception of Massowah. There are no charges in the Navy Estimates for pensions and retirements. No less than £4,440,000 will be expended by Italy during the current year, in the maintenance and construction of her fighting fleet, and in the development of her power in the Mediterranean. The low cost of labour gives a great facility for increasing the tonnage of her fleet.

Making on both sides the necessary rectifications in order to institute a fair comparison, we have

for the French Navy	£6,201,548
or, adding the ordnance vote . . .	764,000
a total of . .	£6,965,548
The corresponding figure for the Italian Navy is	£4,442,960

GERMANY.

The sums demanded for the German Navy since 1884 have been as follows :—

Year.	Ordinary Expenditure.	Extraordinary Expenditure.	Supplementary Votes.	Total.
	£	£	£	£
1884–5	1,360,544	1,445,795	187,500	2,993,839
1885–6	1,054,030	462,970	62,500	2,179,500
1886–7	1,869,946	553,695	70,400	2,494,041
1887–8	1,916,910	457,138	70,400	2,444,448
1888–9	1,795,038	646,023	..	2,441,061

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Germany has no Marine Infantry. Twelve vessels are in commission in China, in Polynesia, and on the West Coast of Africa. Germany has no colonial establishments, no coastguard, nor is she charged with a subsidy similar to our own contribution to the Invalides. For the purpose of comparison, we may take the amount of the French Navy Estimates at £6,201,548, and the German at £2,382,760.

AUSTRIA.

The expenditure for the Austrian Navy in 1882 was £720,000. The amounts voted for 1884 and the succeeding years were as follows:—

Year.	Ordinary Expenditure.	Extraordinary Expenditure.	Total.
	£	£	£
1884 . .	820,381	122,912	943,293
1885 . .	874,050	197,809	1,071,859
1886 . .	902,584	216,897	1,119,481
1887 . .	914,500	216,899	1,131,399
1888 . .	917,807	215,306	1,133,113
1889 . .	918,095	213,728	1,131,823

If it be desired to make a comparison of the annual charges borne by France and those of the neighbouring Continental nations, it will be found that our expenditure—ordinary and extraordinary—will be in 1888 £7,005,548.

The corresponding expenditure for Italy will be	£4,442,960
Germany	2,382,760
Austria	905,280
Total	£7,731,000

It will be seen that the French naval appropriations are less in amount, but only slightly so, than those of the three other leading Maritime Powers of Europe.

The extraordinary expenditure, both in Russia and Austria, shows a tendency to increase. In Italy the extraordinary expenditure was voted for a period of ten years, while our extraordinary expenditure is on a much more precarious footing. We must take into view the responsibilities which devolve on our Navy, and the conditions under which the service is conducted.

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France has an enormous coast-line to protect. Severe maritime conflicts may be apprehended in the seas which bathe her shores. It is incumbent on a Naval Power occupying the geographical position in which France is placed to be prepared and provided at all points for every contingency that may arise.

Cost of French Training Establishment.

Large sums are expended upon the Training Establishments of the Navy. The expenditure is undoubtedly advantageous. The individual excellence of our men is an essential element of our superiority. It is, however, to be noted that this item of expenditure does not burden in anything like the same proportions the Naval Estimates of neighbouring nations. We have wide foreign relations. We have a position of influence in every part of the world which we cannot abandon, and which necessitates a wide distribution of our Naval Forces. Incidentally we have the advantage of giving to our officers and to our seamen an experience in the navigation of the seas, which is quite as useful as that gained in the training squadrons.

The amounts proposed to be expended under the several Votes for the Navy for 1888 and 1889 were :—

Ordinary	£7,766,444
Extraordinary . . .	571,920
Total . . .	£8,338,364

Credit recommended by Committee.

We propose to grant to the Department for the ordinary expenditure a credit in money of £8,178,364, and a credit in old materials of £80,000.

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LIST of FIGHTING SHIPS and TORPE-

Class.	Type.	FRANCE.						
		Completed.		To complete.	To advance.	To commence in 1889.	Total in each Type	Total in each Class
		Recent Types.	Old Types.					
Ironclads	Battle Ships	7	8	6	2	1	24	31
	Belted Cruisers	4	5	..	..	..	9	
	Coast Defence Vessels	6	4	..	..	..	10	
	Gunboats 1st class	..	..	2	2	..	4	
	Gunboats 2nd class	2	..	1	1	..	4	
	Protected Cruisers	..	..	..	1	1	2	
Cruisers	Principal Armament on Main Deck	1	7	2	..	..	10	61
	1st class	..	9	..	3	..	12	
	2nd class	1	12	..	2	..	15	
	3rd class	..	13	1	5	..	19	
	Torpedo Cruisers	3	..	..	1	1	5	
Sloops	1st class	3	9	..	..	..	12	69
	2nd class	..	24	1	..	..	25	
	3rd class	..	5	..	..	..	5	
	Transports	..	14	2	2	..	18	
	Torpedo Sloops or Torpedo Gunboats	4	..	4	..	..	8	
Gunboats	Gunboats	..	16	..	..	..	16	52
	Gunboats, 2nd class	..	36	..	..	..	36	
Torpedo Boats and Torpedo Chasers	Sea-going Torpedo Boats	7	..	11	..	5	23	138
	1st class	20	..	50	..	..	70	
	2nd class	41	..	..	..	..	41	
	Torpedo Scouts	6	..	..	..	..	6	
	Torpedo Transports	..	1	..	..	..	1	1

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Boats of the Principal Fleets of Europe.

ENGLAND.							ITALY.						
Completed.		To complete.	To advance.	To commence between 1st July, 1888, and 1st July, 1889.	Total in each Type.	Total in each Class.	Completed.		To complete.	To advance.	To commence between 1st July, 1888, and 1st July, 1889.	Total in each Type.	Total in each Class.
Recent Types.	Old Types.						Recent Types.	Old Types.					
13	25	7	..	..	45	73	4	3	3	3	..	13	21
2	3	..	..	..	5		..	4	..	..	..	4	
4	10	..	..	..	14		..	4	..	..	..	4	
..	2	..	..	..	2		..	..	..	..	..	..	..
..	..	..	..	..	..		..	..	..	..	..	..	..
1	..	6	..	..	7		..	..	..	..	..	..	..
..	6	..	..	..	8	101	..	3	..	..	..	3	29
8	5	..	..	..	13		5	3	2	..	5*	15	
13	8	4	1	6·5†	32		..	2	..	..	..	2	
9	15	2	..	2	28		..	..	..	..	..	..	
13	..	1	..	6·2†	20		2	..	2	1	4*	9	
5	14	7	3	6	35	127	2	5	..	..	..	7	27
..	..	..	..	1	87		..	2	..	2	..	4	
3	83	..	..	..	..		..	13	..	..	..	13	
..	..	..	..	..	..		..	..	..	..	..	..	
5	..	..	..	..	5		3	..	..	..	..	3	
Included in list of 2nd and 3rd class Sloops.							..	6	2	2	..	10	16
							..	6	..	..	..	6	
61	..	..	..	6	67	159	40	..	25		?	65	130
19	..	..	..	10	29		65	..	..	..	..	65	
51	..	..	..	..	51		..	..	..	..	..	..	..
12	..	..	..	..	12		..	..	..	..	..	..	..
..	1	..	..	1	2	2	1	1	..	..	..	2	2

* Italy is building rapidly sea-going torpedo boats of 85 tons. Four of 125 tons have just been received from Ebling. It is not known exactly what provision will be made in the Estimates for 1888–9 for orders for new vessels. All those which it is proposed in the Estimates to complete or to advance may be considered as available for service in the early part of 1889.

† In some shipbuilding yards, vessels, especially those of small dimensions, are not launched until they are complete. In other yards vessels are launched as soon as they can take the water.

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List of Fighting Ships and Torpedo Boats

Class.	Type.	GERMANY.						
		Completed.		To complete.	To advance.	To commence between 1st July, 1888, and 1st July, 1889.	Total in each Type.	Total in each Class.
		Recent Types.	Old Types.					
Ironclads	Battle Ships	4	7	..	..	..	11	27
	Belted Cruisers	1	1	..	..	..	2	
	Coast Defence Vessels	..	..	..	*	..	1	
	Gunboats 1st class	2	11	..	..	..	13	
	Gunboats 2nd class	..	..	..	..	..	..	..
	Protected Cruisers	..	..	..	..	..	..	..
Cruisers	Principal Armament on Main Deck	2	7	..	..	..	9	30
	1st class	1	7	1	1	1	11	
	2nd class	..	1	1	..	1	3	
	3rd class	..	..	..	..	..	..	
	Torpedo Cruisers	5†	..	1	..	1	7	
Sloops	1st class	..	5	..	..	..	5	16 or 17
	2nd class	..	3 or 4	..	..	..	3 or 4	
	3rd class	..						
	Transports	..	..	..	..	..	..	
	Torpedo Sloops or Torpedo Gunboats	4	..	2	..	2	8	
Gunboats	Gunboats	..	5	..	..	..	5	5
	Gunboats, 2nd class	..	..	..	..	..	..	
Torpedo Boats and Torpedo Chasers	Sea-going Torpedo Boats	49	..	19		?	68	94
	1st class	26	..	..	..	?	26	
	2nd class							
	Torpedo Scouts	..	..	..	..	..	..	..
	Torpedo Transports	..	1	..	1	..	2	2

* The Ironclad in construction referred to above as an ironclad battle ship is in reality a coast defence vessel of 3000 to 4000 tons.

† The German vessels classed as torpedo cruisers are those known in Germany as fast sloops, such as the Pfeil and the Blitz.

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of the PRINCIPAL FLEETS of EUROPE—*continued.*

AUSTRIA.							RUSSIA.						
Completed.		To complete.	To advance.	To commence in 1889.	Total in each Type.	Total in each Class.	Completed.		To complete.	To advance.	To commence in 1889.	Total in each Type.	Total in each Class.
Recent Types.	Old Types.						Recent Types.	Old Types.					
..	3	2	..	..	5		1	2	4	2	2	11	
..	3	..	..	..	3		..	..	..	..	..	..	
..	4	..	..	..	4	14	..	9	..	..	..	9	40
..	..	..	..	..	..		..	13	..	..	..	13	
..	2	..	..	..	2		..	..	..	..	..	..	
..	..	..	..	..	..		6	..	1	..	..	7	
..	5	..	..	..	5		..	1	1	..	..	2	
..	..	2	..	..	2		2	6	..	8 of various types.		8	
..	2	..	..	..	2	20	..	9	..			17	37
..	3	..	..	..	3		8	..	..			8	
6	..	1	1‡	..	1		2	..	..	..	..	2	
..	1§	..	..	..	1		3	..	..	..	..	3	
..	1§	..	..	..	1		Many of the Sloops have no fighting value.						
..	1§	..	..	..	1	8							3
..	3§	..	..	..	3								
1	..	1	..	..	2								
..	6	..	..	..	6	6	9	..	..	..	..	9	9
..	..	..	..	..	..		..	..	..	..	..	..	
12	..	?	?	?	12		24	..	?	?	?	24	
32	..	..	..	..	32	52	28	..	..	..	..	28	115
5+3 being re-constructed	..	..	..	..	8		63	..	..	..	..	63	
	..	..	..	..	..		..	..	..	..	..	..	..
..	1	..	..	1	2	2	..	..	..	..	..	..	..

‡ This torpedo cruiser was not included in the previous lists, which were compiled before the information recently published in the press, to the effect that the vessel had been laid down, had been received. In Austria, great additions are being made to the number of sea-going torpedo boats.

§ These six sloops are of little importance in respect to fighting efficiency.

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French Navy Estimates for the year 1889.

Heads of Expenditure.	Credits proposed.
	£
PERSONNEL.	
Admiralty Office	45,708
Navy Pay	1,329,237
Marines	450,453
Gendarmerie Maritime	34,643
Inspection of Administrative and Financial Services	13,427
Staff of Construction	83,011
Administrative Staff	314,323
Medical Staff	93,104
LABOUR.	
Wages—	
Shipbuilding; new ships; conversions; fitting for sea	398,040
Shipbuilding; repairs	245,948
Armaments; construction of new guns	32,190
Armaments; repairs	36,760
Works; wages	51,286
Victualling	35,120
Master-attendants' and Store-keepers' Departments	290,641
Miscellaneous Wages	16,268
MATÉRIEL.	
Stores and Supplies—	
Admiralty	9,796
Ships fitting for sea; repairs	420,000
Shipbuilding; contracts for new ships	433,760
Shipbuilding; ships building; conversion; fitting out of new or converted ships	744,032
Armaments; for manufacture of new guns	280,000
Carried forward	£5,357,747

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Heads of Expenditure.	Credits proposed.
	£
Brought forward . .	5,357,747
MATÉRIEL—*continued.*	
Stores and Supplies—*continued.*	
Armaments; repairs	378,093
Torpedoes.	99,840
Works; new and large alterations	141,382
Works; repairs	57,616
Clothing	206,000
Victualling	772,000
Barracks	45,081
Medicines	63,583
Machinery	254,684
Fuel and Lighting	33,276
Office Furniture, Printing and Stationery	41,491
MISCELLANEOUS.	
Travelling expenses and freight	195,800
Allowances for lodgings.	194,592
Charitable	45,950
Pensions to Seamen	289,040
Secret Service	2,600
Miscellaneous	10,400
International Exhibition	9,185
Total . . .	£8,198,360

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Heads of Expenditure.	Credits proposed.
	£
Brought forward . .	5,357,747
MATÉRIEL—*continued.*	
Stores and Supplies—*continued.*	
Armaments; repairs	378,093
Torpedoes.	99,840
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Miscellaneous	10,400
International Exhibition	9,185
Total . . .	£8,198,360

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SHIPBUILDING PROGRAMME.—

Class.	Names of Ships.	Date of Order of Commencement.	Where Building.	Estimated Cost, exclusive of Machinery and Armament.	Hulls, Fittings, Outfit, putting Machinery in place.					Labour in 1889.
					Days' Work Estimated.			State of advancement in hundredths.		
					Total to Build.	Number worked 1st Jan., 1889.	Proposed for 1889.	1st January, 1889.	To advance in 1889.	
				£	£	£	£			£
Battle Ships	Neptune	7th Oct., 1880	Brest	546,800	44,000	27,680	9,200	62	20	29,440
	Brennus	31st Dec., 1887	Lorient	580,000	56,000	1,055	10,000	2	17	30,000
	Formidable	13th Dec., 1878	„	660,000	62,000	61,600	400	99	1	1,200
	Hoche	3rd Aug., 1880	„	565,000	54,000	44,564	9,436	82	18	28,307
	Magenta	Sept., 1880	Toulon	546,800	50,000	22,480	10,400	42	20	36,712
										125,659
Battle Ship.	N***	..	Lorient	*	..	..	480	..	1	1,440
Armoured Gunboats, 1st class.	Cocyte	5th Aug., 1882	Cherbourg	103,000	11,600	9,200	2,400	80	20	7,800
	Phlégéton	„	„	103,000	11,600	3,640	4,400	30	39	14,300
	Styx	„	„	103,000	11,600	2,360	2,400	19	20	7,800
										29,900
Belted Cruisers.	Dupuy de Lôme	26th Oct., 1887	Brest	262,680	28,000	2,440	7,000	9	25	22,400
	N***	„	Rochefort	..	..	..	1,240	..	5	4,092
										26,492
Cruisers, 1st class.	Alger	1st Mar., 1887	Cherbourg	168,000	20,000	6,480	5,040	32	25	16,380
	Isly	„	Brest	168,000	20,000	6,120	6,000	30	30	19,200
	Jean-Bart	18th Sept.,1886	Rochefort	168,000	20,000	8,160	7,200	41	36	23,760
										59,340
Cruisers, 2nd class.	Davoust	1st Mar., 1887	Toulon	123,040	14,400	8,880	5,520	61	39	19,486
	Suchet	„	„	123,040	14,400	2,640	480	1	3	1,694
										21,180

* The designs of these ships not having been approved at the time that this Appendix was prepared, the number of days' work in 1889 only is shown.

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Building in Dockyards.

Machinery.										Total Expenditure on Labour, 1889.		
Makers.	Cost.	Days' Work.			Advancement in hundredths.		Labour in 1889.	Cost of Armament. †	Total Cost of Vessel.	Hulls and Fittings.	Machinery.	Total.
		To Complete.	Worked 1st Jan., 1889.	Proposed for 1889.	1st January, 1889.	Proposed for 1889.						
	£	Number of days.	Number of days.	Number of days.				£	£	£	£	£
Indret . .	120,000	194,000	174,000	8,000	94	6	1,240	89,160	755,960	29,440	1,240	30,680
Indret Belleville .	132,000‡	150,000§	800	7,000	..	5	1,085	92,000	804,000	30,000	1,085	31,085
Le Creusot .	85,213	..	..	..	..	..	..	78,960	824,173	1,200	..	1,200
Indret . .	132,000	192,000	177,222	14,778	92	8	2,291	84,520	781,520	28,307	2,291	30,597
Le Creusot .	125,000	..	..	..	..	..	..	89,160	760,960	36,712	..	36,712
							4,616			125,659	4,616	130,274
Indret . .	..	..	..	..	..	..	..	..	..	1,440	..	1,440
Saint Denis (Claparède)	19,400	..	..	..	..	..	..	15,320	137,720	7,800	..	7,800
,,	19,400	..	..	..	..	..	..	14,920	137,320	14,300	..	14,300
,,	19,400	..	..	..	..	..	..	14,920	137,320	7,800	..	7,800
							..			29,900	..	29,900
Saint Denis (Société de la Loire) .	119,704	..	..	..	..	..	..	33,920	416,304	22,400	..	22,400
Industrie .	..	..	..	..	..	..	..	..	..	4,092	..	4,092
							..			26,492	..	26,492
Le Creusot .	92,720	..	..	..	..	..	..	11,240	271,960	16,380	..	16,380
Indret . .	88,000	148,000	38,291	16,000	25	10	2,480	11,240	267,240	19,200	2,480	21,680
,, . .	88,000	148,000	46,485	67,000	31	45	10,385	11,240	267,240	23,760	10,385	34,145
							12,865			59,340	12,865	72,205
,, . .	70,000	135,000	85,000	50,000	63	37	7,750	6,880	199,920	19,486	7,750	27,236
,, . .	70,000	135,000	13,357	14,000	9	10	2,170	6,880	199,920	1,694	2,170	3,864
							9,920			21,180	9,920	31,100

† The hydraulic gun-mountings are included in the vote for Naval Armaments.
‡ In this estimate of £132,000 the boilers are included at a cost of £43,000.
§ This figure refers only to the engines, the boiler being supplied by the Belleville Company.

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SHIPBUILDING PROGRAMME.—

Class.	Names of Ships.	Date of Order to Commence.]	Where Building.	Estimated Cost, exclusive of Machinery and Armament.	Hulls, Fittings, Outfit, putting Machinery in place.					
					Days' Work Estimated.			] State of advancement in hundredths.		Labour in 1889.
					To Build.	Worked 1st January, 1889.	Proposed for 1889.	To 1st Jan., 1889.	To advance in 1889.	
				£	Number of days.	Number of days.	Number of days.			
Cruisers, 3rd class	Surcouf	7th April, 1886	Cherbourg	82,600	330,000	286,000	44,000	86	14	5,720
Torpedo Cruisers	Vautour	2nd Aug., 1882	Toulon	51,600	205,000	166,000	39,000	80	20	5,507
	Wattignies	26th July, 1888	Rochefort	..	220,000	..	75,000	..	34	9,900
										15,407
Transport Sloops	Manche	27th Jan., 1885	Cherbourg	45,280	158,000	57,000	15,000	35	9	1,950
	Rance	7th May, 1883	Lorient	45,280	158,000	130,382	27,618	82	18	3,314
	Vaucluse	18th Sept., 1885	Rochefort	45,280	158,000	94,000	50,000	59	31	6,600
										11,864
Torpedo Sloops or Torpedo Gunboats	N***	.. ..	Lorient	..	70,000	..	50,000	..	71	6,000
	N***	.. ..	„	..	70,000	..	30,000	..	43	3,600
										9,600
Sailing Frigates	Andromède	8th Aug., 1882	„	73,200	180,000	42,328	5,000	23	3	600
	Melpomène	„	Rochefort	73,200	180,000	169,000	11,000	94	6	1,452
										2,052

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Building in Dockyards.

Machinery.										Total Expenditure on Labour, 1889.		
Makers.	Cost.	Days' Work Estimated.			State of advancement in hundredths.		Labour in 1889.	Cost of Armament.	Total Cost of Vessel.	Hulls and Fittings, etc.	Machinery.	Total.
		To Build.	Worked to Jan. 1st, 1889.	Proposed for 1889.	1st January, 1889.	To advance in 1889.						
	£						£	£	£	£	£	£
Saint Denis (Société de la Loire) .	45,221	..	..	..	..	..	..	2,960	130,781	5,720	..	5,720
Société Méditerranée	33,808	..	..	..	..	..	..	3,920	89,328	5,507	..	5,507
Industrie .	..	..	..	..	..	..	..	..	..	9,900	..	9,900
							..			15,407	..	15,407
Indret . .	10,400	27,000	24,258	2,742	90	10	425	3,600	59,280	1,950	425	2,375
„ . .	10,400	27,000	26,142	858	97	3	133	3,600	59,280	3,314	133	3,447
„ . .	10,400	27,000	19,000	8,000	71	29	1,240	3,600	59,280	6,600	1,240	7,840
							1,798			11,864	1,798	13,662
Industrie .	..	..	..	..	..	..	..	..	..	6,000	..	6,000
„ .	..	..	..	..	..	..	..	..	..	3,600	..	3,600
							..			9,600	..	9,600
..	..	..	..	..	..	..	..	9,320	82,520	600	..	600
..	..	..	..	..	..	..	..	9,320	82,520	1,452	..	1,452
							..			2,052	..	2,052

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Summary.

EXPENDITURE ON LABOUR IN DOCKYARDS, 1889. ORDINARY EXPENDITURE, WAGES, BUILDING and CONVERSIONS, and for FITTING OUT of NEW and CONVERTED SHIPS.

Battle ships.	£130,274
Ironclad	1,440
Armoured gunboats	29,900
Belted cruisers	26,492
Cruisers. First class	72,205
„ Second class	31,100
„ Third class	5,720
Torpedo cruisers	15,407
Sloops (Transport)	13,662
Torpedo sloops or Torpedo Gunboats	9,600
Sailing frigate	2,052
Fitting for sea, and alterations after trials	50,197
Completion of ships after delivery by contractors . . .	9,991
Total	£398,040

NOTE.—The cost of wages has been estimated upon the following averages :—

Cherbourg	3·25
Brest	3·20
Lorient	3·00
Rochefort.	3·36
Toulon	3·531
Indret	3·875
Guérigny.	3·30

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Completion of Ships after Delivery by Contractors.

Class.	Name.	Contractors.	Port where completing.	DAYS' WORK.			Cost of Labour in 1889.	ESTIMATED COST.				
				To complete.	Worked 1st Jan., 1889.	Proposed for 1889.		Hulls and Fittings.	Machinery.	Armament.	Fittings for Sea.	Total Cost.
							£	£	£	£	£	£
Battle ships	Marçeau .	Société de la Méditerranée . . .	Toulon .	60,000	..	25,000	3,530	474,000	121,179	102,960	70,000	768,139
Frigate . .	Cécille. .	Société de la Méditerranée . . .	Toulon .	20,000	10,000	10,000	1,412	183,602	116,000	17,200	18,000	334,802
Cruisers—third class	Troude .	Société de la Gironde. . . .	Rochefort .	10,000	5,000	5,000	660	69,575	45,200	2,960	12,600	130,035
	Lalande .	Société de la Gironde. . . .	Rochefort .	10,000	1,370	8,630	1,139	73,575	44,800	2,960	12,600	133,935
	Cosmao .	Société de la Gironde. . . .	Rochefort .	10,000	..	10,000	1,320	73,575	44,800	2,960	12,600	133,935
	Coëtlogon .	Compagnie générale transatlantique. . . .	Brest . .	10,000	..	10,000	1,280	66,400	46,600	2,960	12,600	128,560
Torpedo sloops. Torpedo scouts. Torpedo boats			Cherbourg	..	..	5,000	650	..	..	..	..	..

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SHIPBUILDING PROGRAMME.—

Class.	Names of Ships.	Date of Contract.	Where Building.	Estimated Cost, exclusive of Machinery and Armament.	Hulls, Fittings, Outfit, putting Machinery in place.			Machinery.	
					Advancement in hundredths.		Expenditure in 1889 as per Contract.	Date of Contract.	Makers.
					1st January, 1889.	To advance in 1889.			
				£			£		
Battle Ships	Formidable	..	Lorient	660,000	..	..	..	18 Oct., 1880.	Le Creusot
	Magenta	..	Toulon	546,800	..	..	..	4 Aug., 1884.	Le Creusot
	Marceau	27 Dec., 1885.	La Seyne (Société de la Méditerranée)	474,000	73	27	60,105	23 Apr., 1883.	La Seyne
	Brennus	..	Lorient	580,000	..	..	..	..	Belleville*
							60,105		
Belted Cruisers	Dupuy-de-Lome	..	Brest	262,680	..	..	..	23 Apr., 1888.	Saint-Denis (Société de la Loire)
	N***	..	Rochefort	..	..	..	..	..	Industrie
							..		
Frigates	Tage	3 Aug., 1885.	Saint-Nazaire (Société de la Loire)	209,401	100	Balance	35,521	3 Aug., 1885.	Saint-Nazaire (Société de la Loire)
	Cécille	23 Nov., 1885.	La Seyne (Société de la Méditerranée)	183,602	100	Balance	29,600	23 Nov., 1885.	La Seyne (Société de la Méditerranée)
							65,121		
Cruisers, 1st class.	Alger	..	Cherbourg	168,000	..	..	..	6 June, 1888.	Le Creusot

* The boilers only were made by the Belleville Company.
† The hydraulic apparatus for working guns is included in armaments.

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Building by Contract.

Machinery.				Cost of Armament. †	Completion after delivery by Contractors.	Total Cost of Vessel.	Total Expenditure in 1889.		
Cost.	Advancement in hundredths. 1st January, 1889.	Advancement in hundredths. To advance in 1889.	Expenditure in 1889.				Hulls and Fittings, etc.	Machinery.	Total.
£			£	£	£	£	£	£	£
85,213	100	§	..	78,960	..	824,173	..	..	..
125,000	96	4	..	89,160	..	760,960	..	..	..
121,179*	98	2	..	102,960	70,000	768,139	60,105	..	60,107
{ 44,000‡ / 88,000 }	..	..	8,000	92,000	..	804,000	..	8,000	8,000
			8,000				60,105	8,000	68,107
119,704	25	65	59,852	33,920	..	416,304	..	59,852	59,852
..	..	..	..	..	..	..	..	..	..
			59,852				..	59,852	59,852
144,000	100	Balance §	43,200	17,200	21,080	395,281	35,521	43,200	78,721
116,000	100	Balance §	36,000	17,200	18,000	334,802	29,600	36,000	65,600
			79,200				65,121	79,200	144,321
92,720	20	70	46,360	11,240	..	271,960	..	46,360	46,360

‡ Approximate price. Contract not yet signed.
§ Not including premiums for economy in consumption of fuel.

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SHIPBUILDING PROGRAMME.—

Class.	Names of Ships.	Date of Contract.	Where Building.	Estimated Cost, exclusive of Machinery and Armament.	Hulls, Fittings, Outfit, putting Machinery in place.			Machinery.	
					Advancement in hundredths.		Expenditure in 1889 as per Contract.	Date of Contract.	Makers.
					1st January, 1889.	To advance in 1889.			
				£			£		
Battle Ships	Formidable	..	Lorient	660,000	..	..	..	18 Oct., 1880.	Le Creusot
	Magenta	..	Toulon	546,800	..	..	..	4 Aug., 1884.	Le Creusot
	Marçeau	27 Dec., 1885.	La Seyne (Société de la Méditerranée)	474,000	73	27	60,105	23 Apr., 1883.	La Seyne
	Brennus	..	Lorient	580,000	..	..	..	..	Belleville *
							60,105		
Belted Cruisers	Dupuy-de-Lome	..	Brest	262,680	..	..	..	23 Apr., 1888.	Saint-Denis (Société de la Loire)
	N***	..	Rochefort	..	..	..	..	..	Industrie
							..		
Frigates	Tage	3 Aug., 1885.	Saint-Nazaire (Société de la Loire)	209,401	100	Balance	35,521	3 Aug., 1885.	Saint-Nazaire (Société de la Loire)
	Cécille	23 Nov., 1885.	La Seyne (Société de la Méditerranée)	183,602	100	Balance	29,600	23 Nov., 1885.	La Seyne (Société de la Méditerranée)
							65,121		
Cruisers, 1st class.	Alger	..	Cherbourg	168,000	..	..	..	6 June, 1888.	Le Creusot

* The boilers only were made by the Belleville Company.
† The hydraulic apparatus for working guns is included in armaments.

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BUILDING BY CONTRACT.

Machinery.				Cost of Armament. †	Completion after delivery by Contractors.	Total Cost of Vessel.	Total Expenditure in 1889.		
Cost.	Advancement in hundredths. 1st January, 1889.	Advancement in hundredths. To advance in 1889.	Expenditure in 1889.				Hulls and Fittings, etc.	Machinery.	Total.
£			£	£	£	£	£	£	£
85,213	100	§	..	78,960	..	824,173	..	..	..
125,000	96	4	..	89,160	..	760,960	..	..	..
121,179*	98	2	..	102,960	70,000	768,139	60,105	..	60,107
{ 44,000‡ / 88,000 }	..	..	8,000	92,000	..	804,000	..	8,000	8,000
			8,000				60,105	8,000	68,107
119,704	25	65	59,852	33,920	..	416,304	..	59,852	59,852
..	..	..	..	..	..	..	..	..	..
			59,852				..	59,852	59,852
144,000	100	Balance §	43,200	17,200	21,080	395,281	35,521	43,200	78,721
116,000	100	Balance §	36,000	17,200	18,000	334,802	29,600 ..	36,000	65,600
			79,200				65,121	79,200	144,321
92,720	20	70	46,360	11,240	..	271,960	..	46,360	46,360

‡ Approximate price. Contract not yet signed.
§ Not including premiums for economy in consumption of fuel.

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SHIPBUILDING PROGRAMME.—

Class.	Names of Ships.	Date of Contract.	Where Building.	Estimated Cost, exclusive of Machinery and Armament.	Hulls, Fittings, Outfit, putting Machinery in place.			Machinery.	
					Advancement in hundredths.		Expenditure in 1889 as per Contract.	Date of Contract.	Makers.
					1st January, 1889.	To advance in 1889.			
		..	..	£			£		
Cruisers, 3rd class	Surcouf .	..	Cherbourg .	82,600	..	..	..	2 Aug., 1886.	Saint-Denis (Société de la Loire .
	Forbin .	..	Rochefort .	78,800	..	..	..	2 Aug., 1888.	Saint-Denis (Société de la Loire) .
	Troude .	1 Aug., 1886.	Bordeaux (Société de la Gironde).	69,575	100	Balance	11,400	16 Aug., 1886.	Le Creusot .
	Lalande .	21 Mar., 1887.	Bordeaux (Société de la Gironde).	73,575	96	4	20,400	21 Mar., 1887.	Le Creusot .
	Cosmao .	25 Apr., 1887.	Bordeaux (Société de la Gironde).	73,575	80	20	20,400	25 Apr., 1887.	Le Creusot .
..	Coëtlogon	23 May, 1887.	Penhoët (Compagnie Générale Transatlantique) . .	66,400	90	10	16,000	23 May, 1887.	Penhoët (Compagnie Générale Transatlantique) . .
							68,200		
Torpedo Cruisers	Wattignies	..	Rochefort .	..	..	..	..	..	Industrie .
Torpedo Sloops or Torpedo Gunboats	N*** . .	..	Lorient . .	..	..	..	..	..	Industrie .
	N*** . .	..	Lorient . .	..	..	..	..	..	Industrie .
							..		

* Not including premiums for economy in consumption of fuel.
† Approximate price. Contract not yet signed.

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Building by Contract.

Machinery.				Cost of Armament. ‡	Completion after delivery by Contractors.	Total Cost of Vessel.	Total Expenditure in 1889.		
Cost.	Advancement in hundredths. 1st January, 1889.	Advancement in hundredths. To advance in 1889.	Expenditure in 1889 as per Contract.				Hulls and Fittings, etc.	Machinery.	Total.
£			£	£	£	£	£	£	£
45,221	100	Balance	15,621	2,960	..	180,780	..	15,621	15,621
45,221	100	Balance	15,620	2,960	..	126,981	..	15,620	15,620
45,200	100	Balance *	13,200	2,960	12,600	130,335	11,400	13,200	24,600
44,800	100	Balance *	12,800	2,960	12,600	133,935	20,400	12,800	33,200
44,800	90	10	6,400	2,960	12,600	133,935	20,400	6,400	26,800
46,640	95	5	6,600	2,960	12,600	128,560	16,000	6,600	22,600
			70,241				68,200	70,241	138,441
38,000†	..	..	12,000	..	..	..	..	12,000	12,000
20,000†	..	..	16,000	..	..	..	..	16,000	16,000
20,000†	..	..	12,000	..	..	..	..	12,000	12,000
			28,000				..	28,000	28,000

‡ The hydraulic apparatus for working guns is included in armaments.

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Summary.

PURCHASE OF SHIPS FROM CONTRACTORS. COST OF MATERIALS AND MACHINERY FOR SHIPS BUILDING IN THE DOCKYARDS.

	£
Battle ships	68,106
Belted cruisers	59,852
Frigates	144,329
Cruisers. First class	46,360
„ Third class	138,440
Torpedo cruisers	12,000
Torpedo sloops or Torpedo Gunboats	28,000
Torpedo boats	138,372
Materials used in dockyard construction	425,381
Alterations, contingencies, and premiums for horse-power and speed	120,000
	£1,180,840

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Torpedo Boats.

Class.	Name.	Date of Contract.	Makers.	Cost, as per Contract.	Advancement in Hundredths. To 1st Jan., 1889.	Advancement in Hundredths. To advance in 1889.	Expenditure, as per Contract.	Cost of Armament.	Total Cost.
				£			£	£	£
Torpedo Scouts	Ouragan	23 Aug., 1886	Saint-Nazaire (Société de la Loire)	22,000	100	Balance	..	640	22,640
	Avant-Garde	7 Nov., 1887	Le Havre (A. Normand)	19,480	85	15 (including Balance)	9,480	640	20,120
	Audacieux	25 July, 1888	Société de la Méditerranée	17,680	75	25 „ „	4,400	640	18,240
	Agile	25 July, 1888	Société de la Méditerranée	17,600	75	25 „ „	4,400	640	18,240
Sea-going Torpedo Boats	Bouët-Villaumez, Edmond Fontaine and Dehorter	23 Feb., 1885	Claparède	36,000	100	Balance	2,810	1,200	37,200
	N***	..	Industrie	13,600*	..	.. ..	10,400	400	14,000
	N***	..	Industrie	13,600*	..	.. ..	10,400	400	14,000
	N***	..	Industrie	13,600*	..	.. ..	10,400	400	14,000
	N***	..	Industrie	13,600*	..	.. ..	10,400	400	14,000
	N***	..	Industrie	13,600*	..	.. ..	10,400	400	14,000
Torpedo Boats	Nos. 75-86 inclusive	22 June, 1885	Société de la Loire	84,240	100	Balance	59,282	..	84,240
	Nos. 87-92	22 June, 1885	Société Cail	42,120	100	Balance		..	42,120
	Nos. 93-98 and 121-125	22 June, 1885	Schneider Co.	76,820	100	Balance		..	76,820
	Nos. 101-114	22 June, 1885	Société de la Méditerranée	97,480	100	Balance		..	97,480
	Nos. 115-120	15 Feb.. 1886	Société de la Gironde	41,640	100	Balance		..	41,640
	Nos. 126-127	12 Sept., 1887	A. Normand	26,160	100	5 (including Balance)	6,000	800	26,960
	Nos. 128-129			25,600	95			800	26,400
							138,372		

* Approximate price. Contract not yet signed.

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Note by M. Weyl on the French Fleet in Commission, 1889.

The salient features of the French Navy Estimates for 1889 are summarised by M. Weyl in an article contributed to *Le Yacht*.

The number of men afloat in European waters will be increased by 2200 to 2400, as compared with 1888.

The number of ships in the training squadron will be increased. Nine ironclads and seven cruisers and torpedo sloops will be in commission in the Mediterranean. A North Atlantic squadron will be formed, consisting of three ironclads, a torpedo cruiser, and a torpedo sloop. The ships will be manned with reduced complements. The Colbert will be manned with 493 men, the Terrible and Indomptable with 307. In the Atlantic the Marengo, Océan and Suffren will be manned respectively with 436, 437 and 425 men.

It will be obvious that the proportion of cruisers to ironclads in the squadron will be insufficient.

The torpedo flotilla for coast defence will be manned by 1722 men. The number of boats in commission is as under:—

Port.	Sea-going.	1st class.	2nd class.	In reserve.
Cherbourg	1	3	5	23
Brest	1	2	5	16
L'Orient	1	1	3	11
Rochefort	1	2	..	5
Toulon	1	8	6	29

The ships in commission on foreign stations will be as follows:—

Atlantic: 4 cruisers, 1 sloop, 1 gunboat.
Pacific: 3 cruisers, 1 armed transport.
East: 1 ironclad, 1 cruiser, 1 sloop, 2 gunboats.
Indian Ocean: 2 cruisers, 1 armed transport, 1 gunboat.
Cochin-China: 1 paddle sloop, 1 gunboat.

The training establishments of the French Navy cost £514,648.

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German Navy Estimates, 1889-90.

EXPENDITURE UNDER THE SEVERAL VOTES.

Head of Service.	Voted 1889-90.	Voted 1888-89.
	£	£
Admiralty Office	31,222	30,720
Hydrographic Office	8,639	7,954
Observatory	11,787	11,317
Salaries, Wages, and Contingencies in Scientific Departments	9,899	9,750
Martial Law	1,477	1,388
Divine Service	2,343	2,305
Wages, Officers and Men	443,213	405,435
Shipbuilding, Repairs	274,150	283,270
Victualling	115,639	156,044
Clothing	5,692	5,029
Care of Barracks and Buildings	46,383	43,770
Lodging Allowances	35,235	33,640
Medical	30,375	29,059
Travelling Expenses and Freight	23,888	21,500
Training Establishments	7,590	6,453
Building of Ships and Works	501,728	572,388
Guns and Fortifications	107,521	107,168
Torpedo and Mining Gear	50,151	49,416
Pilotage, Buoyage, Lights	10,199	10,017
Miscellaneous	8,550	8,414
Total £	1,725,639	1,795,037

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Expenditure on Special Services.

Ordinary.

	£
Ironclad O.	80,000
Submarine Miner	45,000
Cruiser C.	30,000
Sloop F.	35,900
Corvette H.	35,000
Cruiser D.	35,000
Armoured Battle-ship A.	40,000
„ „ B.	40,000
„ „ C.	40,000
„ „ D.	40,000
Ironclad P.	25,000
„ Q.	25,000
Two Torpedo Vessels	50,000
Steam Tank Vessel, Kiel	9,500
Torpedo Service Vessel	14,575
Electric-light Fittings	6,000
Armament, Cruiser C.	12,500
„ Sloop F.	5,500
Small Arms	29,150
Extension of Powder Magazines	25,000
Enlargement of Office of Artillery Depôt, Geestemunde	500
Purchase of Land, Diedrichsdorf	2,250
Enlargement of Store for Mining Gear	7,900
Torpedo-fittings for Ships	9,900
Enlargement of Buildings for Torpedo Service	5,260
Refitting Submarine Mines	9,000
Buildings, Wilhelmshaven	1,123
„ Friedrichsort	12,875
Barracks, Cuxhaven	11,000
Drill Shed, Wilhelmshaven	5,500
Completion of Offices, Kiel	950
Provision Stores, Wilhelmshaven	600
Repair of St. Elizabeth's Church, Wilhelmshaven	400
Additions to Stock of Clothing for the Navy	33,900
Establishment of Naval School of Telegraphy	825
Foundations for Lighthouse, Friedrichsort	900
Total ordinary	£724,008

Extraordinary.

	£
Four Patrol Boats	16,000
Armament, Ironclad O.	22,000
Armament for Defences of Mouth of Elbe	15,000
Improved Torpedo Armaments for Torpedo Boats	32,000
Two Submarine Miners	5,680
Torpedo Establishments, Kiel, Wilhelmshaven, and Dantzig	2,000
	£102,680

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SHIPS IN COMMISSION, 1889–90.

Stations.	Class.	Months in Commission.
Flying Squadron	1 Frigate	12
	3 Corvettes	12
West Coast of Africa	1 Cruiser	12
	1 Gunboat	12
East Coast of Africa	2 Cruisers	12
Asia	2 Gunboats	12
Australia	1 Cruiser	12
	1 Gunboat	12
Mediterranean	1 Despatch boat	12
Squadron of Instruction	4 Frigates	12
Manœuvres	4 Ironclads	5
	1 Sloop	5
Reserve Squadron	2 Ironclads	12
	1 Ironclad	6
	2 Torpedo vessels	12
Armoured Coast-defence Flotilla	3 Ships	1
Torpedo-boat Flotilla	1 Sloop	6
	2 Torpedo vessels	6
	16 Torpedo boats	..
Instruction of Cadets	1 Sailing frigate	6
Instruction of Boys	1 Ship	12
	„	7
	2 Brigs	6
Gunnery Ships	1 Ship	12
	1 Tender	12
	1 „	6
Torpedo Instruction	1 Ship	12
	1 Tender	12
	1 Experimental	6
Guard-ships, Kiel and Wilhelmshaven	2 Ironclads	12
Mining Instruction	1 Ship	12
Pilot Instruction, Officers	1 Sloop	6
Imperial Yacht	1 Ship	12
Surveying	2 Ships	6
Protection of Fisheries, German Ocean	1 Sloop	6½
Experiments	1 Ship	12
Steam Trials	1 Ironclad	6
	1 Cruiser	2
	1 Sloop	3
	1 „	2

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Précis of Memorandum on General Administration of German Navy.

It is our duty to point out the rapid development of foreign navies, in comparison with the German, in heavily armoured and fast ships.

This will be evident on a careful comparison of ships completed and completing in the German and in foreign navies. The reinforcement of the German fleet will not be best effected by a strict adherence to a programme of construction laid down some years ago.

In laying down a new programme, regard must be had to the new requirements of naval war, especially as they relate to the torpedo, an arm in which the German Navy has no rival. The necessity for strengthening the torpedo and coast-defence flotilla has led to the postponement of vigorous efforts in the construction of fighting ships for general service.

Ironclads.—The German Navy has no battle-ship of the first-class which is entirely up to date. No such ships have been built since 1884. We have lost or condemned as obsolete the Prinz Adalbert, Grosser Kurfürst, Kronprinz, Friedrich Karl, and Hansa. They have not been replaced.

All our ships, though still fit for service, are of obsolete type. The time has now arrived for putting some ships in hand of the first-class, for the line of battle. Such ships are required as a nucleus, around which our existing vessels of inferior strength may gather. The combination will greatly add to the fighting efficiency of the older ships. The German Admiralty does not view with favour the construction of ships having the great displacements which have been reached in Italy. The shipbuilding policy of Germany must depend to some extent on hydrographical considerations. Our coasts and harbours do not afford sufficient depth of water for ships of heavy draught. Our maximum displacements should not exceed 9000 to 10,000 tons. Within these limits as to dimensions it is possible to build ships of great fighting power. We have confidence in the value of the types selected by the Admiralty. They should be pushed forward promptly, as soon as the money for their construction has been voted.

It is proposed to commence in 1889–90 four large ships, which will form a nucleus for the fighting Navy of Germany.

Armoured Cruisers.—We are in the same position of inferiority in regard to cruisers and coast-defence vessels, as we have already recognised in the case of battle-ships. Our ships in construction of

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the class B may be regarded as fully equal to modern requirements. It is proposed to lay down ten cruisers. Nine should be pushed forward as rapidly as possible. The vessels proposed in the new programme would take the place of vessels which would have been laid down in the ordinary course to keep up the effective strength of the Navy.

Frigates have in recent years been used only as instruction-vessels, or as flag ships on foreign service. It is not proposed to replace any ships of this class as they become no longer fit for service. Ironclads will take their place.

Corvettes are becoming as obsolete as frigates. We have only three vessels of this class in good condition. It is intended, following the example of other Powers, to organise a reserve of swift cruisers from the merchant service. As a means of providing the Navy with ships of serious fighting efficiency, and manned with well-disciplined crews, too much reliance must not be placed on a reserve of this description. It has therefore been decided to build a sufficient number of swift cruisers for the protection of German commerce. England, within the last year, has laid down ten ships of the class we propose. Twenty-two protected ships are already on the effective list of that power. France has 19, Italy 15, Spain and America 11, Russia 4—either built, building, or ordered. Ten cannot be an excessive number for the German Navy. Having already three efficient ships, seven additional should suffice.

Cruisers.—These are required for foreign stations. Heavy armaments are unnecessary. Spar-decked vessels are not required. A light draught for navigation among coral reefs is desirable. A moderate speed is essential. These qualities are more needed than strength for battle. Two cruisers are required on the west coast, and two on the east coast of Africa, two on the Asiatic station, and three in the South Seas and for Australasia.

Our obsolete cruisers should be replaced by improved vessels of the Schwalbe type. Additional vessels should be built, in numbers sufficient to replace those which are removed from the lists of efficient ships. Including gunboats, and the Sperber and C. in progress, we have twelve vessels of the class under consideration. Eight of these are in commission. The Cyclops is unfit for further service. The Nautilus and Möwe are in the same condition, and have been ordered home. The new ships recommended should be taken in hand in due time. Larger ships may otherwise be ordered for services for which smaller vessels with proportionate crews would be efficient.

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COMPARISON of RUSSIAN, ITALIAN, and

—	RUSSIA.	
NAVY ESTIMATES	£6,335,100	
Amount for Shipbuilding: New Ships and Conversions	£2,370,675	
	Ready or Launched.	On the Stocks.
Ocean-going Battle-ships and Armoured Cruisers	17, including:—	4, viz.:—
	Tons.	Tons.
	Catharine II. . . 10,180	Nicolai I. . . 8,440
	Tchesme . . . 10,180	Alexander Newsky . 7,570
	Sinope 10,180	2 Ships similar to the Tchesme.
	Alexander II. . . 8,440	
	Admiral Nachimoff 7,780	
	Pamyat Azova . . 6,000	
	(All of modern type.)	
Protected Cruisers	4, viz.:—	
	1 of 600 tons.	
	2 of from 2,950 to 5,400 tons.	

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French Navy Estimates and Ships.

ITALY.		FRANCE.	
£4,169,940		£8,278,364	
£1,110,000		£1,578,872	
Ready or Launched.	**On the Stocks.**	**Ready or Launched.**	**On the Stocks.**
15, including:—	**3,** viz.:—	**30,** including:—	**3,** viz.:—
Tons.	Tons.	Tons.	Tons.
Duilio . . 11,138	Re Umberto. 13,298	Admiral Duperré . 11,100	Brennus . . 11,000
Dandolo . 11,202	Sicilia . . 13,298	Baudin . . 11,380	Magenta . . 10,581
Italia . . 13,898	Sardegna . 13,860	Formidable. 11,300	Dupuy de Lôme 6,297
Lepanto . 13,550		Hoche . . 10,650	
Rugg. di Lauria 11,000		Marceau . 10,581	
Franc Morosini 11,000		Neptune . 10,581	
And. Doria 11,000		Devastation 10,500	
		Courbet . 10,500	
		(All of modern type.)	
14, viz.:—	**1**	**7,** viz.:—	**12**
4 of 740 tons, the remainder of from 2,000 to 3,500 tons.		4 of 1,280 to 1,800 tons.	
		3 of 4,500 to 7,000 tons.	

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Sloops.—Vessels of this class, but with great speed, are absolutely necessary.

The resources for manning our Navy will be sufficient for our needs until the new ships are ready for commission.

The summary of the proposed new construction is as follows:—

4 Ironclads.
9 Armoured coast-defence vessels.
7 Protected cruisers.
4 Cruisers.
2 Sloops.
2 Torpedo vessels.

The total estimated cost and its annual appropriation are shown in the following statement:—

		1889–90.	1890–1.	1891–2.	1892–3.	Estimated Cost of each Ship.
		£	£	£	£	£
Ironclad	A	40,000	155,000	155,000	115,000	465,000
	B	40,000	155,000	155,000	115,000	465,000
	C	40,000	155,000	155,000	115,000	465,000
	D	40,000	155,000	155,000	115,000	465,000
Armoured Cruiser	P	25,000	100,000	50,000	..	175,000
	Q	25,000	100,000	50,000	..	175,000
	R	..	75,000	100,000	..	175,000
Total		210,000	895,000	820,000	460,000	2,385,000

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Italian Navy Estimates, 1889-90.

PRÉCIS OF MEMORANDUM OF COMMISSION ON NAVY ESTIMATES, 1888–89. (JULY 1ST, 1888, TO JUNE 30TH, 1889.)

Deducting £90,817 for Rent of Crown Property, and £100,000 for depreciation of ships in commission, the estimates for effective expenditure in 1887–88, as revised, amount to—

Ordinary Expenditure . .	£3,572,644
Extraordinary Expenditure . .	964,640
Total	£4,537,284

The Estimates for 1888–89 as submitted definitely to the Commission for examination amount to:—

Ordinary Expenditure . . .	£3,682,550
Extraordinary Expenditure . .	1,045,860
Total	£4,728,410

ORDINARY EXPENDITURE.

Ships fitting out, in reserve, and completing.—According to the Estimates for 1888–89, the expenditure under this head was estimated at £198,480, exceeding by £28,240 the estimate for 1887–88, and by £12,240 the amount appropriated, the vote having been increased by £16,000.

This sum of £198,480 it is proposed to apply as follows, viz.:—

1. To keep in commission the permanent squadron, consisting of 4 ironclads, 2 despatch vessels, and 1 tank vessel.

2. To carry out naval manœuvres of three months' duration, and to commission for that purpose 40 ships, including 12 armoured ships and cruisers, 6 despatch vessels and torpedo cruisers, 18 sea-going torpedo-boats, and 4 transport ships.

To maintain the following, viz.:—

3. In the East, 4 ships.

4. In South America, 3 ships.

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5. In the Red Sea, 9 ships.

6. In Indo-Chinese waters, 1 stationary vessel.

7. In home waters, several fully equipped vessels for purposes of instruction and military service.

8. Twelve torpedo-boats fully equipped at the various home coast-stations.

9. Eight ships in reserve in the principal ports of the kingdom for local defence.

10. To provide for the temporary commission of new ships for experimenting with machinery, guns, &c. Under this head an increased vote of £24,720 is asked for, and it is proposed to apply it next year to the purposes mentioned above.

Materials and labour for repairs of Ships.—An increase is demanded of £60,000 for materials, and £25,340 for labour, making altogether £408,000 for materials, and £272,000 for labour, or a total of £680,000.

An attempt has been made to ascertain what percentage of the value of the fleet would represent the maximum cost of maintenance, with a view to the treatment of any excess over such maximum as extraordinary expenditure, requiring the authority of a special Vote of Parliament. Detailed statistics are in course of preparation; but in the meantime the Minister considers that 6·75 per cent. of the value would be a sufficient provision for maintenance, and in this opinion the Commission concurs.

The value of the fleet on 1st July, 1889, will amount to £13,599,196; and as the amount asked for its maintenance, £680,000, is considerably below 6·75 per cent. of its value, £917,946, the appropriation may be sanctioned.

One of the members of the Commission is in favour of including in the Estimates the whole of the amount representing 6·75 per cent. of the value of the fleet.

Guns, Torpedoes, and Small Arms.—The proposed estimates amount as in the year 1887–88 to £301,500, of which £56,000 is for labour, leaving the balance of £245,500 for materials. This last item has been increased by £32,000, so that the revised amount is £277,500.

This £32,000 is to be applied to the substitution of breech-loading guns for the present muzzle-loaders on the ironclad Maria Pia, the completion of the supply of steel projectiles and *granate-mina* recently introduced into the service for the large and medium-sized guns, the completion of the supply of ammunition for quick-firing guns, the further acquisition of machine guns, repeating rifles, revolvers of new type, the increase of the number of electric projectiles with dynamos

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for ironclads of the Maria Pia type; and finally the provision of electrical *matériel* and torpedoes for the new ships approaching completion.

Construction.

The estimates make provision for the following:—

"*A.*" *Continuation of Works in progress.*—1. Completion of first-class battle ships Morosini, Doria, and Re Umberto.

2. Completion of second-class ship Fieramosca.

3. Completion of third-class ships Montebello, Monzambano, Confienza, Volturno, and Curtatone.

4. Construction of first-class ships Sicilia and Sardegna.

5. Construction of two second-class protected ships.

6. Construction of four third-class torpedo cruisers.

7. Construction of two third-class gun vessels.

8. Construction of seagoing and harbour-defence torpedo-boats.

9. Construction of tenders and harbour vessels.

10. Construction of steam-launches.

"*B.*" *New Construction.*—11. Construction of second-class protected ship.

12. Construction of four third-class torpedo cruisers.

13. Construction of two third-class gunboats.

14. Construction of torpedo-gunboats.

15. Construction of seagoing torpedo-boats.

16. Construction of tenders.

17. Construction of steam-launches.

18. Construction of boats for dockyard service.

The estimates under this head are £880,000, as in 1887–88, in addition to £230,000 for extraordinary expenditure for "Shipbuilding," making together £1,110,000.

An increase of £208,000 for "Shipbuilding" is asked for in order to accelerate the building of new ships and the completion of those in construction, as well as to purchase ten torpedo-boats at a cost of £143,000.

Extraordinary Expenditure.

Shipbuilding.—The original amount of £230,000 has been increased to £438,000, as explained above.

The sum voted in 1887 was £1,480,000, of which £250,000 was expended in 1887–88. There remains therefore available for future years £792,000.

Naval Yard at Taranto.—The appropriation of £30,000 exceeds by £4000 that of 1887–88.

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Coast Defences.—The sum of £140,000 out of the balance of £600,000 voted in 1884 was appropriated in the Estimates to the completion of the submarine defences at the more important ports. It is now proposed to increase this appropriation by £40,000, making £180,000 in all.

This would leave £80,000 unappropriated out of £600,000.

Fortifications "Maddalena."—Here also the original estimate of £160,000 has been increased by £40,000.

This increase is justified by the necessity of accelerating the execution of these fortifications and their armament.

The vote of £520,000 in 1887 will supply this sum of £200,000, and £240,000 will remain unappropriated.

Torpedoes.—In 1887 £1,000,000 was voted for the purchase of torpedoes.

£40,000 thereof has been appropriated up to and including the current year; for the period under review it is proposed to appropriate £40,000, since increased to £80,000.

The addition of £40,000 is required for the purpose of providing torpedoes for all the boats completed and completing, and the apparatus for their discharge.

£880,000 out of the £1,000,000 would remain unappropriated.

Quick-firing Guns.—Out of the 1887 Vote of £160,000, £20,000 is now to be appropriated, leaving £140,000 unappropriated.

Conclusion.—The Commissioners are convinced that the increased expenditure for 1888–89 is necessary to effectively provide promptly for our naval defence.

To avoid or defer this expenditure might entail serious consequences in the event of war. The Commissioners, however anxious to advocate economy, have no option but to ask that the proposals be sanctioned.

NAVY ESTIMATES.—FINANCIAL YEAR 1ST JULY, 1888, TO 30TH JUNE, 1889.

ORDINARY EXPENDITURE—GENERAL EXPENSES.

	£
Admiralty	34,625
Expenditure on various services connected with the Mercantile Marine	221,805

N.B.—In this total are included the payments for subsidies and premiums to Merchant Ships, amounting to £162,960.

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EXPENDITURE FOR NAVAL SERVICES.

	£
Ships fitting out, in reserve and completing	223,200
General Staff of the Navy	102,681
Corps of Constructors	35,997
Commissariat Service	36,876
Medical Service	20,805
Wages—Men	293,161
Assistants to Constructors	36,426
Accountants	11,095
Police	10,761
Telegraph Service	8,014
Telegraph Materials	3,796
Provisions	231,586
Lighting	6,064
Hospital Services	15,113
Honorary Distinctions	1,060
Fuel	147,800
Salaries and Wages—Workshops and Fortifications	10,240
Training Establishments	20,550
Naval Academy	10,880
Scientific Services—*Personnel*	3,436
„ „ *Matériel*	12,035
Law Charges	1,200
Transports	46,000
Materials for repair of Ships	408,000
Labour for above	272,000
Guns, Torpedoes and Small Arms	277,500
Labour for construction and repair of Armaments	56,000
Works Department—Repairs	88,000
Completion, 1st class Battle Ships	
Completion, 2nd class Ships	
Completion, 3rd class Ships	
Building 1st class Ships	
„ two 2nd class Protected Ships	
„ four 3rd class Ships—Torpedo Cruisers	
„ two 3rd class Vessels—Gun Vessels	
„ Sea-going and Harbour Defence Torpedo Boats	
„ Tenders and Harbour Vessels	
„ Steam Launches	880,000
Ships to commence:—	
2nd class Protected Ship	
Four 3rd class Ships—Torpedo Cruisers	
Two 3rd class Vessels—Gunboats	
Torpedo Gunboats	
Sea-going Torpedo Boats	
Tenders	
Steam Launches	
Boats for Dockyard Service	
Naval Expenditure at Massowah	152,770
	3,425,046
Rents for lands occupied by Government	92,110

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EXTRAORDINARY EXPENDITURE.

	£
Half Pay	4,400
Expenditure for Mercantile Marine	3,460
Shipbuilding	438,000
Naval Yard at Taranto	30,000
Dry Dock, Spezia	80,000
Dockyard Improvements, Venezia	10,000
Coast Defences	180,000
Fortifications, Maddalena	200,000
Torpedoes	80,000
Quick-firing Guns	20,000
Total	1,038,000
Depreciation of Ships in Commission	100,000

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Russian Navy Estimates.

1889, 1888 AND 1887.

	1889.	1888.	1887.
	£	£	£
Central Administration	156,218	158,830	159,714
Rewards, Pensions, Education of Children	42,960	40,193	43,637
Naval Schools	48,996	50,140	48,732
Medical	66,008	68,510	70,726
Wages	303,075	326,818	329,946
Provisions	81,457	95,741	81,709
Clothing	81,825	88,215	82,392
Navigation	466,558	458,118	449,292
Hydrographic Office	38,005	36,487	38,239
Guns and Torpedoes	350,432	353,742	334,592
Construction	1,361,068	1,358,200	1,330,343
Workshops and Offices	221,167	206,903	191,494
Hire, Maintenance, Construction, and Repair of Buildings	275,645	267,542	281,035
Religion	36,666	35,292	36,666
Sundries	80,040	84,758	119,176
	3,610,120	3,629,489*	3,597,693

* Converted at the rate of 1*s.* 10*d.* per rouble.

LIST OF RUSSIAN WAR VESSELS ABROAD, 1ST JAN., 1889.

Zabiyaka	was at the Piræus.
Mandjur	„ „
Dimitri Donskoï	„ Nagasaki.
Razboynik	„ „
Coreetz	„ Yokohama.
Vitiaz	„ Hongkong.
Nayezdnik	„ Sydney.
Rynda	left Aden for Suez, Jan. 3rd.
Admiral Nachimoff	was at the Cape.
Kreyzer	„ Rio Janeiro (on way to Pacific).

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PROGRAMME FOR 1889.

To leave Cronstadt for the Pacific: Vladimir Monomach, Admiral Korniloff, Djigit.

To return from the Pacific: Dimitri Donskoï, Vitiaz, Rynda, Nayezdnik.

To return from the Mediterranean: Zabiyaka.

The Minin will cruise in the Atlantic with naval recruits.

The Alexander II. and Pamyat Azova will undergo a series of trials in home waters.

The Nicholas I. will be launched as soon as the Neva breaks up.

In the Baltic the following squadrons or divisions will be fitted out:—

Practical squadron:—Peter the Great, General Admiral, Duke of Edinburgh, Admiral Spiridoff, Plastun, Vjestnik, Lieutenant Ilyn, Ilmen, Slavianka (small vessel), and four fish torpedo boats.

To this squadron will be attached for artillery practice the Pervenets, Kreml, Rousalka, and Toochá—for mining practice, Africa, Vzriff, fish torpedo boat, eight spar torpedo boats, and the blockship Bogatyr; and Giliak—also a torpedo boat with divers.

The Bogatyr will carry detachments for laying down and taking up mines in channels, &c.—for pupils of naval school: Svjetlana Stretlana, Skobeleff, Boyarni, Bayan, and one spar torpedo boat—for students of the technical school: Snieg and one spar torpedo boat—for master gunners, one torpedo boat with Hotchkiss guns—also the Skhernazá division for duty amongst the skhers (Skerries, rocky islands) of the Gulf of Finland, Charodeika, Groza, Yersh, Vikhr, Bouroun, Dnieper (sea-going steamer), Razboynik, and two spar torpedo boats.

For hydrographic work amongst the Skerries of Abo, the gunboat Groza, steamer Kopchik, four iron barges, four steam cutters, &c.

The Asia will be used by pupils of the new stoker and engineer school.

For harbour work at Cronstadt: St. Petersburg, Ijora (paddle-vessel), Polyezny, Koldun, Raibka, Vodolei, four small steamers, and four steam launches.

In the Black Sea:—

Practical squadron: Catherine II., Tchesmé, Kubanetz, Teretz, Vraletz.

The Sinope and torpedo vessels Captain Sacken will undergo trials.

The gunboat Tchernomoretz will go as *stationaire* to the Piræus;

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the schooner Pzezuappé to Constantinople, and schooner Redoot-Kale to Galatz.

Mining squadron: Gonetz, two first-class torpedo boats, and six spar torpedo boats.

For harbour service: Eriklik, Donetz, and Zaporojetz.

In Siberia:—

Mining division: Aleüt, two first-class and three spar torpedo boats. The gunboats Coreetz and Sivootch will both go for a nine months' cruise in the Pacific.

TOTALS FOR 1889. (Officers and men afloat.)

In foreign waters: 1 admiral, 35 staff officers, 100 officers, 88 supernumeraries, 97 specialists (artillery, engineering, &c.), and 4796 men; or altogether, 5117 officers and men.

In home waters: 10 admirals, 150 staff officers, 394 officers, 151 supernumeraries, 428 specialists, and 14,491 men, or altogether, 15,624 officers and men. Grand total, 20,741 officers and men.

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XII.

Report (with some excisions) of the Secretary of the United States Navy.

NAVY DEPARTMENT,
Washington, December 1, 1888.

TO THE PRESIDENT:

The presentation of this annual report affords an appropriate occasion for a brief review of the condition of the Navy as it will exist on the 4th day of March, 1889, in comparison with the same as it existed on the 4th day of March, 1885. An opinion can thereby be formed, not only as to what has been done, but as well what remains to be done toward the creation of a Navy appropriate to a country with the resources and commercial interests of the United States.

State of the United States Navy in 1885.

In March, 1885, the United States had no vessel of war which could have kept the seas for one week as against any first-rate naval power, and was dependent upon English manufacturers for the forgings of guns, for armour, and for secondary batteries (this last item including machine and rapid-fire guns). It became necessary, therefore, to consider what the policy of the Government should be with reference to the creation of its implements of war; and it was determined that the United States ought to be independent of all other countries in that regard.

In the annual report of the Department for 1886 the matter was referred to as follows:—

Departmental report of 1886.

"At the present time and for many years to come, in the event of a conflict with either a first or second class naval power, it would be quite impossible for the United States, as at present situated, to produce within its territory either the armour required for armoured ships or the guns necessary for their armament. Nor would it be possible for the Navy of the United States to protect such articles in transit across the ocean in time of war. As at present situated, the country would be entirely defenceless in the absence of any ability to produce armour or the larger high-powered guns. . . .

"It is certainly a most lamentable circumstance that a country

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like ours, with its immense product of iron and steel, should be content to be dependent upon the manufacturers of any other nation for the fabrication of armour and high-powered guns, both of which are now essential and indispensable parts of a modern fighting ship. Whatever its commercial policy may be, in the production of its necessary implements of war, it should certainly be independent. . . .

"This policy involves delay in the construction of the first vessels authorised, but at the end of five years the country would, by pursuing it, be independent and in a much stronger position in every respect than would result from any other course. . . ."

The adoption of a definite policy as above indicated involved a delay in the construction of all classes of armoured ships of at least three years, but was determined upon without hesitation as the only course consistent with a proper regard for our national dignity and pride. The efforts of the Department were, therefore, in the first instance devoted to the problem of domesticating in this country the industries for the making of armour and of the forgings for high-powered guns.

The first step in the new direction.

As a first step in this direction all purchases of armour and gun steel abroad were discontinued. Contracts were pending in March, 1885, for armour and gun steel purchased in England, amounting to $227,365.29. The final payments upon those contracts made subsequent to that date amounted to about $100,000; no further purchases of either armour or gun steel have been made abroad since March, 1885.

The second step.

As a second step, the wants of the Department for armour and gun steel were allowed to accumulate until contracts of some magnitude could be offered to the competition of domestic manufacturers, one condition of the bidding to be the erection of a plant in this country adequate to the manufacture of both armour and gun steel up to the highest standard of European requirements.

This was deemed an experiment by the Department at the time, and was accompanied with great individual effort towards enlisting the steel manufacturers in the undertaking, but resulted successfully, and upon the 1st day of June, 1887, contracts were entered into with the Bethlehem Iron Company of Bethlehem, Pa., one of the largest and most enterprising of American steel manufactories, under which the United States was guaranteed that within two and one-half years from the date of the contract this country would have within its borders a plant equal to and probably the superior of any in the world for the production of armour and the forgings for high-powered guns. This, in the judgment of the Department, must be deemed to

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THE NEW NAVY.—

[NOTE.—Engine weight of the following

Name.	Length between perpendiculars.	Breadth, extreme.	Mean draught.	Displacement.	Maximum, I. HP.	Type of engine.	Weight of Machinery.
	Feet.	Ft. In.	Ft. In.	Tons.	I. HP.		Tons.
Maine . .	310	57 0	21 6	6648	*9000	Twin screw, vertical, triple expansion	890
Texas . .	290	64 1	21 6	6300	*8609	Ditto	816
Coast defence	250	59 0	14 6	4000	*5400	Twin screw, vertical, inverted, triple expansion	431
Puritan. .	280	60 1½	18 2	6060	†3058	Twin screw, horizontal, compound	‡1260
Terror . .	250	55 6¼	14 1⅜	3815	†838	Twin screw, inclined, compound	546
Miantonomoh	250	55 6¼	14 1⅜	3815	§1030	Ditto	569
Amphitrite.	250	55 6¼	14 1⅜	3815	*1000	Ditto	‖560
Monadnock	250	55 6¼	14 1⅜	3815	*3000	Twin screw, horizontal, triple expansion	351
Armoured cruiser .	..	..	..	7500	..	.. ..	..

* Estimated. † Dock trial.

‡ According to lines (draught taken before and after machinery placed on board); weight, 1290 tons, including engine and boiler fouudations. Foundation will weigh not more than 30 tons.

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ARMOURED VESSELS.

vessels does not include engine stores.]

Armour.		Battery.		Condition.
Side.	Turret and barbette.	Main.	Secondary.	
Ins.	Inches.			
11	10½	4 10-in. B. L. R. 6 6-in. B. L. R.	4 6-pdr. R. F. 8 3-pdr. R. F. 2 1-pdr. R. F. 4 37*mm.* R. C. 4 Gatlings	Building at navy-yard, New York. Flat and vertical keel-plates, nearly all in line on keel-blocks. Frames about one-half bent, and ready to be riveted to floor-plate and erected.
12	12	2 12-in. B. L. R. 6 6-in. B. L. R.	4 6-pdr. R. F. 8 3-pdr. R. F. 4 1 pdr. R. F. 4 37*mm.* R. C. 2 Gatlings	Partially laid down on moldloft floor at navy-yard, Norfolk, Va.
16	16–14	1 16-in. 115-ton B. L. R. 1 12-in. 48-ton B. L. R. 1 15-in. dynamite gun	6 33-pdr. R. F. 3 9-pdr. R. F. 2 6-pdr. R. F. 4 3-pdr. R. F.	*Ready for immediate advertisement for contracts.* Plans and specifications now in Bureau of Construction and Repair, completed and ready for inspection of bidders. Plans of machinery will be completed in thirty days.
12	11½	4 10-in. B. L. R.	2 6-pdr. R. F. 2 3-pdr. R. F. 2 37*mm.* R. C. 2 Gatlings	Awaiting completion, navy-yard, Norfolk, Va. Hull, except turrets, side armour-plates, and joiner-work, complete. Steam machinery erected on board.
7	11½	Ditto	2 6-pdr. R. F. 2 3-pdr. R. F. 2 37*mm.* R. C. 2 Gatlings	Undergoing alterations, navy-yard, New York, for the reception of pneumatic gear for operating turrets, steerer, &c.
7	11½	Ditto	2 6-pdr. R. F. 2 3-pdr. R. F. 2 37*mm.* R. C. 2 Gatlings	To be completed in four months, navy-yard, New York.
7	11½	Ditto	2 6-pdr. R. F. 2 3-pdr. R. F. 2 37*mm.* R. C. 2 Gatlings	Hull, except turrets, side armour, and joiner-work, nearly completed. Steam machinery erected on board. Wilmington, Del.
7	11½	Ditto	2 6-pdr. R. F. 2 3-pdr. R. F. 2 37*mm.* R. C. 2 Gatlings	Hull, except turrets, side armour, and joiner-work, nearly complete. Navy-yard, Mare Island, Cal.
..	..	.. ..	..	Building authorised Sept. 7, 1888; not yet commenced; cost not to exceed $3,500,000.

§ Free route trial.
‖ According to lines; weight furnished by Bureau of Steam Engineering, 546 tons.

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have been the first important step towards the creation of a Navy modern in character.

In view of the general congratulation with which the making of these contracts was received, it is proper to say that the Department in that regard reaped very largely the rewards which belonged to others. The subject had been previously investigated and reported upon by two special boards—the Gun Foundry Board, Rear-Admiral Edward Simpson, Chairman; and the Board on Fortifications and other Defences, presided over by the Secretary of War, both boards having for members Army and Navy officers of high standing and attainments upon the subject of ordnance; and further by the two Special Committees—of the Senate, Senator J. R. Hawley, Chairman; and of the House, Representative S. J. Randall, Chairman. But for the thorough elucidation of the subject which had thus previously been made, and through which the conditions of the problem had been thoroughly made known, it is not likely that the efforts of the Navy Department would have been attended with success.

The Department was especially indebted to two of its own officers, Lieut. Commander Francis M. Barber, U. S. Navy, and Lieut. W. H. Jacques, U. S. Navy, who, from their familiarity with the subject as well as the high order of their talents, aided greatly in supplying the necessary information to domestic manufacturers, and seconded in every way the efforts of the Department toward enlisting practically companies having large resources and capital in the undertaking.

On pp. 678, 679 is a list of armoured vessels heretofore authorised by Congress.

List of new armoured ships authorised.

From this list it will be observed that, so far as armoured ships are concerned, the subject is yet to be treated in a broad way by the Department and by Congress. At the present time the conditions are such that everything necessary to a first-class fighting ship can be produced and furnished to the Department in this country as soon as in the course of construction any element or feature is required; but this has never heretofore until the present time been true, and therefore the consideration of the subject has been necessarily postponed by the Department until the present time.

In the table the double-turreted monitors will not be ships of a high class. Their completion was recommended by the Department solely as a choice of evils, the question which was presented being, whether several million dollars which had been spent upon them should be thrown away, or the balance necessary to complete them be appropriated.

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Unarmoured Cruisers.

Efforts hitherto directed to the building of unarmoured ships.

From the foregoing statement it will be observed that the efforts of the Department in ship construction have necessarily, since March, 1885, been devoted to unarmoured vessels; *and as to these, the Department is able to report that when the ships in course of construction and those authorized shall have been completed, the United States will rank second among the nations in the possession of unarmoured cruisers, or "commerce destroyers," having the highest characteristics, viz., of a size of* 3000 *tons and upward, and possessing speed of* 19 *knots and upward.*

The importance which has been placed upon this branch of naval armament will be appreciated from the statement that England and France possess 65 vessels of the class known as unarmoured cruisers. The attention of the world was attracted to the destructive effect which was produced upon the commerce of the United States by the cruisers fitted out under the auspices of the Confederacy in the war of the rebellion. The total tonnage of the registered vessels of the United States had risen year by year until, in 1861, it amounted to 2,642,628 tons; and between 1861 and 1866 it was reduced to 1,492,926 tons, or, in other words, to the point which we had reached in 1849, from which decline we have never recovered. The insurance war risk upon American vessels during the war rose in exceptional cases to as high as 25 per cent.

Sir Charles Wilson, Director-General of the Ordnance Survey of Great Britain, recently stated that—

A point made clear by history.

"If there is one point clearer than another in the history of commerce it is this, that when a state cannot effectually protect its carrying trade in time of war, that trade passes from it and does not return. . . ."

And Lord Charles Beresford, lately a member of the Board of Admiralty, in the same connection stated:

Lord Charles Beresford.

"To-day one-half of the people in England would absolutely have no bread to eat but for the food that comes in over the sea. It is a matter of life and death for you to protect the commerce, and you have not the ships to do it with. . . ."

We cannot at present protect our coast, but we can return blow for blow, for we shall soon be in condition to launch a fleet of large and fast cruisers against the commerce of an enemy, able to inflict the most serious and lasting injury thereon.

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THE NEW NAVY.—

Name and Type.	Keel laid.	Dimensions.						Displacement.	Collective horse-power or Speed.	Type of Engine.	Weight of Machinery.
		Length between Perpendiculars.		Breadth, extreme.		Mean Draught.					
	Yr.	Ft.	In.	Ft.	In.	Ft.	In.	Tons.			Tons.
Dolphin (Despatch vessel)	1883	240	0	32	0	14	3	1485	*2240	Single screw, vertical, compound	411
Boston (Protected cruiser)	1883	270	3	42	0	17	0	3189	*3780	Single screw, horizontal, compound	690
Atlanta (Protected cruiser)	1883	270	3	42	0	17	0	3189	*3356	Ditto	690
Chicago (Protected cruiser)	1883	315	0	48	2	19	0	4500	*5084	Twin-screw, compound, overhead beam	1,007·51
Charleston (Protected cruiser)	1887	300	0	46	0	18	6	3730	†7000	Twin-screw, horizontal, compound	710
Baltimore (Protected cruiser)	1887	315	0	48	6	19	6	4413	9000	Twin-screw, horizontal, triple expansion	900
Yorktown (Gunboat)	1887	230	0	36	0	14	0	1700	†3000	Ditto	320
Petrel (Gunboat)	1887	175	0	31	0	11	7	890	†1100	Single screw, horizontal, compound	130
Newark (Protected cruiser)	1887	310	0	49	2	18	9	4083	8500	Twin-screw, horizontal, triple expansion	850

* Indicated horse-power on trial. † Guaranteed indicated horse-power.

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ARMOURED VESSELS.

Battery.		Total Contract Cost of Hull and Machinery.	Date of Act authorizing building.	Contract executed.	Months allowed to complete.	Where built or building.	Condition.
Main.	Secondary.						
in. B. L. R.	2 6-pdrs. R. F. 4 47*mm.* R. C. 2 Gatlings	$ 315,000	Mar. 3, 1883	July 23, 1883	..	Roach, Chester, Pa.	Commissioned
in. B. L. R. in. B. L. R.	2 6-pdrs. R. F. 2 3-pdrs. R. F. 2 1-pdr. R. F. 2 47*mm.* R. C. 2 37*mm.* R. C. 2 Gatlings	619,000	Ditto	Ditto	..	Ditto	Ditto
-in. B. L. R. -in. B. L. R.	Same as Boston.	617,000	Ditto	Ditto	..	Ditto	Ditto
-in. B. L. R. -in. B. L. R. -in. B. L. R.	2 6-pdrs. R. F. 2 1-pdr. R. F. 4 47*mm.* R. C 2 37*mm.* R. C. 2 Gatlings	889,000	Ditto	July 26, 1883	..	Ditto	Ditto
8-in. B. L. R. 6-in. B. L. R.	4 6-pdrs. R. F. 2 3-pdrs. R. F. 2 1-pdr. R. F. 4 37*mm.* R. C. 2 Gatlings	1,017,000	Mar. 3, 1885	Dec. 28, 1886	18	Union Iron Works, San Francisco, Cal.	Launched.
8-in. B. L. R. 6-in. B. L. R.	Same as Charleston.	1,325,000	Aug. 3, 1885	Dec. 17, 1887	18	Cramp's, Philadelphia, Pa.	Ditto
6-in. B. L. R.	2 6-pdrs. R. F. 2 3-pdrs. R. F. 1 1-pdr. R. F. 2 37*mm.* R. C. 2 Gatlings	455,000	Mar. 3, 1885	Jan. 31, 1887	12	Ditto	Ditto
6-in. B. L. R.	2 3-pdrs. R. F. 1 1-pdr. R. F. 2 37*mm.* R. C. 2 Gatlings	247,000	Ditto	Dec. 22, 1886	12	Columbian Iron Works, Baltimore, Md.	Ditto
6-in. B. L. R.	4 6-pdrs. R. F. 4 3-pdrs. R. F. 2 1-pdr. R. F. 3 37*mm.* R. C. 4 Gatlings	1,248,000	Mar. 3, 1886	Oct. 27, 1887	24	Cramp's, Philadelphia, Pa.	Building

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THE NEW NAVY.—

Name and Type.	Keel laid.	Dimensions. Length between Perpendiculars.	Dimensions. Breadth, extreme.	Dimensions. Mean Draught.	Displacement.	Collective Horse-power or Speed.	Type of Engine.	Weight of Machinery.
	Yr.	Ft. In.	Ft. In.	Ft. In.	Tons.			Tons.
Philadelphia . . (Protected cruiser)	1888	315 0	48 6	19 2½	4324	*19 knots	Twin-screw, horizontal, triple expansion	900
San Francisco . . (Protected cruiser)	1888	310 0	49 2	18 9	4083	*19 knots	Ditto	900
Concord . . . (Gunboat)	1888	230 0	36 0	14 0	1700	†3400	Ditto	340
Bennington . . (Gunboat)	1888	230 0	36 0	14 0	1700	†3400	Ditto	340
Vesuvius . . . (Dynamite Cruiser)	1887	246 3	26 5	9 0	725	*20 knots	Twin-screw, vertical, triple expansion	247
1st Class (Torpedo-boat)	1888	138 0	14 6	3 7	99	‡23 knots	Twin-screw, vertical, quadruple expansion	47
Cruiser No. 6 ‖ *b* . (Protected cruiser)	..	..	..	..	5300	§20 knots	..	..
Cruisers No. 7 and 8 ‖ *c*. (Protected cruiser)	..	..	..	..	3000	§19 knots	..	..
Cruisers No. 9, 10, and 11 ‖ *d*. (Protected cruiser)	..	..	..	..	2000	(*a*)	..	..
Practice vessel ‖ *e*. (Practice cruiser)	..	..	..	..	800	..	..	..

* Guaranteed speed.
† Guaranteed indicated horse-power.
‡ Estimated speed by bidder.
§ Required by the Statute.
‖ Authorized by Act approved Sept. 7, 1888.

a Speed to be fixed by the Secretary of the Navy.
b Cost, exclusive of armament and speed premiums, not to exceed $1,800,000.
c Cost, exclusive of armament and speed premiums, not to exceed $1,100,000.
d Cost, exclusive of armament and speed premiums, not to exceed $700,000.
e Cost, $260,000. To be built by contract in accordance with terms of Act approved August 3, 1886.

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UNARMOURED VESSELS—*continued.*

Battery.		Total Contract Cost of Hull and Machinery.	Date of Act authorizing building.	Contract executed.	Months allowed to complete.	Where built or building.	Condition.
Main.	Secondary.						
12 6-in. B. L. R.	4 6-pdrs. R. F. 4 3-pdrs. R. F. 2 1-pdr. R. F. 3 37*mm.* R. C. 4 Gatlings	$ 1,350,000	Mar. 3, 1887	Oct. 27, 1887	24	Cramp's, Philadelphia, Pa.	Building.
Ditto	Same as Philadelphia	1,428,000	Ditto	Oct. 26, 1887	24	Union Iron Works, San Francisco, Cal.	Ditto
6 6-in. B. L. R.	Same as Yorktown	490,000	Ditto	Nov. 15, 1887	18	Palmer & Co., Chester, Pa.	Ditto
Ditto	Same as Yorktown	490,000	Ditto	Ditto	18	Ditto	Ditto
3 15-in. dynamite guns	2 3-pdrs. R. F. 1 1-pdr. R. F. 2 37*mm.* R. C. 2 Gatlings	350,000	Aug. 3, 1886	Feb. 11, 1887	12	Cramp's, Philadelphia, Pa.	Ready for trial.
8 automobile torpedoes	2 6-pdrs. R. F.	82,750	Ditto	Mar. 1, 1888	..	Herreshoff Company, Bristol, R. I.	Building.
..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..

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Great speed is absolutely necessary in unarmoured cruisers.

The one characteristic which an unarmoured cruiser must possess is great speed. She must be able to escape from ironclads and outrun, so as to overhaul, merchantmen. If slower than ironclads she could not keep the sea, and if slower than merchantmen she might as well stay in port.

Condition of things in 1885.

An examination of the condition of the Department in 1885 regarding the production of power by machinery showed clearly that the matter required most careful investigation and thorough consideration before entering upon new work. There were pending in March, 1885, contracts for the construction of the machinery of the double-turreted monitors Puritan, Terror, and Amphitrite. The contracts were entered into in 1883. Specifications were furnished by the Bureau of Steam Engineering. From an examination of the characteristics of the machinery of those vessels, as shown in the last table, it will be seen that the weight of the machinery as compared with the resulting power is as follows:

Vessel.	Weight of Machinery.	I.H.P.
Puritan . . .	1,260	3,058
Terror	546	838
Amphitrite . . .	560	1,000

This machinery was at least a quarter of a century behind the age. Tested by the amount of power produced by it, and making allowance for nature of trial, &c., the best that could be expected would be an average of 2½ indicated horse-power per ton of machinery. At that rate, in order to obtain a 19-knot ship, the machinery would require the entire tonnage displacement of the ship.

An examination of the state of the art in 1885 led to the conclusion that the machinery of naval vessels ought to be so designed as to produce 10 horse-power for each ton of machinery; and it was determined to make that the standard, and to enter into no contracts that were not based substantially thereon.

Plans of machinery were purchased abroad, which upon trial had approximated that result. Bidders were authorized to bid upon the plans thus submitted to competition, or were permitted to submit their own plans, but were obliged to guarantee the results determined upon by the Department under severe penalties for failure and with compensating premiums in case of attaining better results.

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The present improved state of things.

It results that all the contracts for the construction of ships which have been entered into since March, 1885, call for the production of power by machinery equal to the highest standards. The efforts of the Department in this matter have been cordially seconded by the bureau chiefs; and it is believed that, at the present time, the Department has reached the point where entire reliance can be placed upon it for the production of war vessels equal in character to those of any other country.

THE SAVINGS OF THE DEPARTMENT ARE PAYING FOR THE NEW NAVY.

Savings.

It is gratifying to be able to report that, as will be seen from the table on p. 688, *notwithstanding the large expenditures for the new Navy in the last three years, the reduction in other directions has made the total expenditures of the Department less for these years than for the three years ending June* 30, 1884, *the ordinary expenses of the Department having been reduced over* 20 *per cent.*

[The year 1884–85 was omitted from the table as not having been wholly in either administration.]

Total expenditures of the Department for three years ending June 30, 1884, compared with the three years ending June 30, 1888, items being taken from reports of Fourth Auditor of the Treasury and distributed under the various objects of expenditure.

ORDINARY BUREAU EXPENSES IN WHICH SAVINGS HAVE BEEN MADE.

Expenditures.	Years ending June 30, 1882, 1883, 1884.	Years ending June 30, 1886, 1887, 1888.
	£	£
Bureau of Construction and Repair	902,035	599,484
Bureau of Steam Engineering	653,683	448,238
Bureau of Provisions and Clothing	777,479	803,665
Bureau of Yards and Docks	566,454	455,277
Bureau of Equipment and Recruiting	516,216	413,257
Bureau of Ordnance	175,288	146,203
Bureau of Navigation	102,237	65,262
Bureau of Medicine and Surgery	63,946	54,560
Pay, Miscellaneous	221,164	195,718
Contingent, Navy	65,801	2,359
Total	£4,044,303	£3,184,023
Grand Total	£9,595,871	£9,366,110

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ITEMS fixed by STATUTE or for other reasons beyond the CONTROL of the SECRETARY, including also EXPENDITURE for INCREASE of the NAVY.

Expenditures.	Years ending June 30, 1882, 1883, 1884.	Years ending June 30, 1886, 1887, 1888.
	£	£
Pay of the Navy	4,202,765	4,350,423
Pay Marine Corps, &c.	521,587	514,966
Naval Academy	116,604	110,181
Increase of the Navy	..	436,866
Vessels and Monitors	..	232,720
Steel Cruisers	257,270	282,558
Monitors	118,548	69,321
Testing Clark's deflective Turrets	2,092	769
Coaster's Harbour Island	9,967	8,730
Naval Hospital	48,529	42,574
Naval Asylum	35,122	32,424
Naval War College	..	2,798
Naval Cemeteries	288	100
Navy Yard Commission	254	..
Naval Station, Port Royal, S. C.	1,110	4,567
Tuition Naval Cadets, Greenwich	180	..
Japanese Award	2,340	..
Bounty, Prize Money, Awards, and Reliefs	55,478	10,205
Arctic Expedition	139,871	4,745
Mexican War	63	15,927
Transit of Venus	13,588	..
Pay Advisory Board	..	1,034
Purchase Steamer Stiletto	..	5,000
Payments, prior, 1881-82	25,922	56,179
Total	£5,551,568	£6,182,087

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Coast and Harbour Defence Vessels.

By Act approved March 3rd, 1887, the following appropriation was made:

For floating batteries or rams or other naval structures to be used for coast and harbour defences, one million dollars. The final cost of said floating batteries, rams or other naval structures, exclusive of armament, shall not exceed two million dollars.

In the last Annual Report of the Department the considerations were stated leading to the conclusion that it would be unwise for the Department to follow the course of the European powers in building unprotected torpedo-boats: and in the present uncertainty regarding the practicability of submarine boats, and while waiting the practical trial of the dynamite gunboat, it has been deemed wise for the Department to build one light-draught, heavily armoured, harbour-defence floating battery or ram, for which designs have been prepared by the Bureau of Construction and Steam Engineering, in consultation with the Chief of the Bureau of Ordnance. The advertisements for this vessel call for the submission of bids in the month of February next. The characteristics will be found stated in the table of armoured vessels before mentioned.

Naval Progress during the Year.

The necessity for increased numbers of fast protected cruisers, whether for purposes of protecting or destroying commerce, or for service with a fleet as scouts, has been emphasized during the naval manœuvres of the year, and is fully recognised by all naval powers.

Blake and Blenheim.

The fastest, largest, and most powerful protected cruisers yet laid down are the Blake and Blenheim (English), of 9000 tons displacement, 20,000 indicated horse-power, trial speed 22 knots, and continuous sea-speed 20 knots, with a coal supply sufficient to steam 3000 miles at that speed. The armaments of these vessels will consist of two 9·2-inch B. L. and ten 6-inch R. F. G.* The vessels have heavy protective decks, ranging from 4 to 6 inches in maximum thickness.

Piemonte.

The fastest protected cruiser built during the year is the Piemonte. This vessel has a displacement somewhat over 2500 tons, carries six 6-inch B. L. and six 36-pounder R. F. G.,* has a protective deck of 3½ inches maximum thickness, and is expected to develop nearly 12,000 indicated horse-power and 21½ knots speed. The Piemonte has

* Rapid-fire guns.

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* Rapid-fire guns.

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been bought from Sir William Armstrong & Co. by the Italian Government.

Armour ships more necessary since the introduction of high explosive shells.

But with the increase of the number of cruisers it has been recognized, in view of the recent introduction of high explosive projectiles, and the increase of power and rapidity of fire of rapid-fire and other guns, that renewed attention must be given to the armoured fleet, and the prevailing opinion in England, France, Italy, Germany, and Russia is strongly in favour of additional armoured ships to be built at an early date. In these new vessels the armour will be much more widely distributed, and will certainly protect the battery and crew as well as the water line and machinery. The destructiveness of high explosive shell fire against unprotected sides emphasizes the peculiar advantages of the monitor type for coast-defence service.

At no time have the increase and development of navies abroad received greater attention or greater expenditure of money and talent than at present. The table on p. 691 indicates the number of cruisers built or building, together with the number of armoured vessels building, and a statement of the annual expenditure for new construction for the navies of England, France, Italy, and Spain.

Weights of machinery have been too much reduced.

While speed is still considered as the most important characteristic of the modern cruiser, it is now generally recognized that too much has heretofore been sacrificed to reducing weights of machinery beyond the limits necessary to secure reliable results. This has been particularly illustrated by the numerous accidents to machinery and boilers in many of the most recent English vessels taking part in the naval manœuvres last summer. An increase of weight and machinery found necessary to properly maintain the desired speed entails either a reduction of ordnance, coal, and other weights, or an increase of displacement in each type; and this latter is the direction in which designs of cruisers (not especially built for police duties in time of peace) are now advancing.

Mobilization.

With the question of increasing the fleet that of mobilization and preparation for war receives equal consideration, and all Navies are devoting the greatest attention and study not only to the development of their resources for the supply of war material and the fortification of naval bases, but also to the improvement and proper training of their reserves of men. The naval manœuvres of England and France were this year chiefly devoted to testing their capacity for rapid mobilization. The operations of the next naval war will certainly follow immediately upon its declaration, and the nation unprepared will find itself at the mercy of perhaps an inferior foe.

As regards guns the principal developments of the year have been

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in improved powder and projectiles, in the adoption of rapid-fire guns of about 30 to 45-pounder calibre to replace the 5-inch B.L. rifle, and in the experiments with high-explosive projectiles fired from high-power powder guns. Guns, powder, and projectiles.

Number of Protected or partially Protected Cruisers built or building.

Speed.*	England.	France.	Italy.	Spain.
20 knots . . .	5	3	1	3
19 knots . . .	5 + 2†	11	10	0
18 knots . . .	0	0	0	0
17 knots . . .	8	5	0 + 1	0
16 knots and less . .	0 + 26†	0	0 + 1	0 + 3†
Total . .	18 + 28†	19	11 + 2†	3 + 3†
Grand Total .	46	19	13	6

Armoured Vessels building.

19 knots . . .	0	0	0	6
18 knots . . .	1	0	3	0
17 knots . . .	2	4	0	0
16 knots and less . .	2	0	3	1
Total . .	5	4	6	7

Expenditure for new Construction.

Vessels and machinery .	$18,346,000	$8,997,000	$6,359,000	‡$41,365,000
Armament . . .	9,068,000	..	270,000	..
Total . .	$27,414,000	..	$6,629,000	..

The greatest improvement in the manufacture of gunpowder has been made in France and Germany, notably in the former, whereby initial velocities have been increased to 2400 and even 2600 foot-seconds with reduced powder charge, while the pressures are kept well within the limits required by safety. Such an increase of velocity increases the energy of the projectile of the 6-inch gun about Gunpowder.

* Speeds given are trial speeds; 10 to 12 per cent. reduction should be made to get corresponding maximum sea speed.

† Indicates partially protected cruisers. This does not include a large number of vessels which have no protection.

‡ To be expended for new construction through nine years.

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been bought from Sir William Armstrong & Co. by the Italian Government.

Armour ships more necessary since the introduction of high explosive shells.

But with the increase of the number of cruisers it has been recognized, in view of the recent introduction of high explosive projectiles, and the increase of power and rapidity of fire of rapid-fire and other guns, that renewed attention must be given to the armoured fleet, and the prevailing opinion in England, France, Italy, Germany, and Russia is strongly in favour of additional armoured ships to be built at an early date. In these new vessels the armour will be much more widely distributed, and will certainly protect the battery and crew as well as the water line and machinery. The destructiveness of high explosive shell fire against unprotected sides emphasizes the peculiar advantages of the monitor type for coast-defence service.

At no time have the increase and development of navies abroad received greater attention or greater expenditure of money and talent than at present. The table on p. 691 indicates the number of cruisers built or building, together with the number of armoured vessels building, and a statement of the annual expenditure for new construction for the navies of England, France, Italy, and Spain.

Weights of machinery have been too much reduced.

While speed is still considered as the most important characteristic of the modern cruiser, it is now generally recognized that too much has heretofore been sacrificed to reducing weights of machinery beyond the limits necessary to secure reliable results. This has been particularly illustrated by the numerous accidents to machinery and boilers in many of the most recent English vessels taking part in the naval manœuvres last summer. An increase of weight and machinery found necessary to properly maintain the desired speed entails either a reduction of ordnance, coal, and other weights, or an increase of displacement in each type; and this latter is the direction in which designs of cruisers (not especially built for police duties in time of peace) are now advancing.

Mobilization.

With the question of increasing the fleet that of mobilization and preparation for war receives equal consideration, and all Navies are devoting the greatest attention and study not only to the development of their resources for the supply of war material and the fortification of naval bases, but also to the improvement and proper training of their reserves of men. The naval manœuvres of England and France were this year chiefly devoted to testing their capacity for rapid mobilization. The operations of the next naval war will certainly follow immediately upon its declaration, and the nation unprepared will find itself at the mercy of perhaps an inferior foe.

As regards guns the principal developments of the year have been

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in improved powder and projectiles, in the adoption of rapid-fire guns of about 30 to 45-pounder calibre to replace the 5-inch B.L. rifle, and in the experiments with high-explosive projectiles fired from high-power powder guns. Guns, powder, and projectiles.

Number of Protected or partially Protected Cruisers built or building.

Speed.*	England.	France.	Italy.	Spain.
20 knots . . .	5	3	1	3
19 knots . . .	5 + 2†	11	10	0
18 knots . . .	0	0	0	0
17 knots . . .	8	5	0 + 1	0
16 knots and less . .	0 + 26†	0	0 + 1	0 + 3†
Total . .	18 + 28†	19	11 + 2†	3 + 3†
Grand Total .	46	19	13	6

Armoured Vessels building.

19 knots . . .	0	0	0	6
18 knots . . .	1	0	3	0
17 knots . . .	2	4	0	0
16 knots and less . .	2	0	3	1
Total . .	5	4	6	7

Expenditure for new Construction.

Vessels and machinery .	$18,346,000	$8,997,000	$6,359,000	‡$41,365,000
Armament . . .	9,068,000	..	270,000	..
Total . .	$27,414,000	..	$6,629,000	..

The greatest improvement in the manufacture of gunpowder has been made in France and Germany, notably in the former, whereby initial velocities have been increased to 2400 and even 2600 foot-seconds with reduced powder charge, while the pressures are kept well within the limits required by safety. Such an increase of velocity increases the energy of the projectile of the 6-inch gun about Gunpowder.

* Speeds given are trial speeds; 10 to 12 per cent. reduction should be made to get corresponding maximum sea speed.

† Indicates partially protected cruisers. This does not include a large number of vessels which have no protection.

‡ To be expended for new construction through nine years.

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75 per cent. and increases its penetration from 12 to about 15½ inches in iron.

The 4·72-inch quick-firing gun.

The Armstrong 4·72-inch rapid-fire gun (generally known as the 36-pounder) now fires a projectile of 44 pounds with a muzzle velocity of 2,373 foot-seconds and a penetration of over 9 inches in iron. This gun has fired ten well-aimed shots in 1 minute and 40 seconds. Its weight is now 42 hundredweight. It has been introduced into the English service and forms the principal armament of six cruisers, of 1600 to 1900 tons displacement, now building. It has also been introduced into the Italian navy on board the new cruiser Piemonte.

The 6-inch quick firer.

An Armstrong 6-inch rapid-fire gun has been completed and is now undergoing trial. It is expected to fire a projectile weighing about 110 pounds, with a powder charge of 40 pounds and chamber pressure of less than 18 tons.

The 33-pounder quick firer.

The Hotchkiss 33-pounder has also been recently tried, with satisfactory results, giving a velocity of 2034 foot-seconds, and a penetration of over 8 inches. The rapidity of aimed fire was 10 rounds per minute.

A 6-pounder Driggs-Schroeder gun has been built during the year by the Driggs Ordnance Company, and is now at the Naval Ordnance Proving Ground for trial.

The steel cast guns received from the Pittsburgh Steel Casting Company, and the Standard Steel Casting Company, of Thurlow, have been machined and finished at the Washington navy yard and sent to the proving ground, where they will be immediately tried.

Melenite in England and France.

While the results of experiments made with melenite shells in France and England have been closely guarded, it seems assured that these projectiles have been safely fired from service guns, and that their bursting effect against the unarmoured portions of a vessel is most destructive—against the armoured portions the explosive effect is said to be not very great. The manufacture and use of melenite has certainly been greatly developed in France, while the original patent rights have been purchased by an English firm and are now undergoing development in England.

Howell torpedo.

In this country the Hotchkiss Ordnance Company has established works for the manufacture of the Howell torpedo, for which it has purchased the rights.

Patrick torpedo.

The Patrick torpedo, spoken of in my last report, has been still further developed, and has on trials before a naval board shown valuable qualities for harbour defence. One of these torpedoes has been purchased by the French navy.

The recent naval manœuvres abroad have shown that torpedo boats

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must still be regarded as most useful for coast and harbour defence. At the present time England is building two classes of torpedo boats, the first, of 130 feet length, 85 tons displacement, and 22½ knots

Torpedo boats, England.

Heads of Appropriation.	Appropriations for Fiscal Year ending June 30, 1888.	Amount Drawn during Fiscal Year ending June 30, 1888.	Balances Undrawn June 30, 1888.
	£	£	£
Pay of the Navy	1,400,000	1,114,743	285,256
Pay, Miscellaneous	41,000	39,992	1,007
Contingent, Navy	1,400	374	1,025
Pay of the Marine Corps	130,332	110,549	19,783
Quartermaster's Department of the Marine Corps	45,125	44,289	836
Naval Academy	40,766	36,773	3,992
Navigation and Navigation Supplies	16,700	14,679	2,020
Ordnance and Ordnance Stores	25,280	20,352	4,927
Repairs, Ordnance	3,000	2,771	228
Torpedo Corps	11,560	9,801	1,758
Equipment of Vessels	125,000	98,220	26,779
Transportation and Recruiting, Equipment and Recruiting	5,000	4,879	120
Naval Training Station, Coaster's Harbour Island, R. I.	2,800	2,174	625
Maintenance, Yards and Docks	34,000	30,993	3,006
Repairs and Preservation of Navy-yards	90,000	81,738	8,261
Naval Asylum, Philadelphia, Pa.	12,633	8,763	3,870
Medical Department, Medicine and Surgery	11,500	10,087	1,412
Naval Hospital Fund	6,000	5,999	..
Repairs, Medicine and Surgery	4,000	3,851	148
Provisions, Navy	224,200	170,473	53,726
Construction and Repair	188,738	166,287	22,450
Steam Machinery	135,000	123,294	11,705
Contingent (Bureaus)	24,000	19,589	4,510
Civil Establishment at Yards and Stations	39,826	38,824	1,002
	2,617,860	2,159,394	458,446
Deduct amount due General Account of Advances June 30, 1888	..	..	256,568
			201,878
In the hands of Disbursing Officers June 30, 1888	..	..	42,588
			£244,466

speed, armed with three tubes, giving practically all-around fire, and rapid-fire guns; the second, intended for ship's use, of about 11 tons displacement, 17½ knots speed, and armed with one training torpedo

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Torpedo boats, France.

tube. France is building four deep-sea torpedo boats, 137 to 147 feet long, 100 to 119 tons displacement, 20¼ to 22½ knots speed, armed with two to three training torpedo tubes and two revolving cannon; also 41 boats, 115 feet long, 55 tons displacement, armed with two tubes and two revolving cannon. Some of these boats carry the spar torpedo. In the new English and in all French torpedo boats powder

Italy.

is used for discharging the torpedoes. Italy is building 30 boats, 127 feet long, 85 tons displacement, armed with two torpedo tubes and two revolving cannon; also two smaller boats, 101 feet long, and 34

Germany.

tons displacement. Germany is now building 19 new boats, 121 feet long, 83 tons displacement; armament, two bow tubes and two revolving cannon.

Submarine boats.

The French Navy Department is now giving its attention to a new type of submarine boat, of 30 tons displacement, and it is reported that the Germans are experimenting with one of the Nordenfelt type. The Spaniards also have recently launched at one of their dockyards a new type of submarine boat, of 87 tons displacement. No submarine boat yet tried can be considered as satisfactory.

The table on p. 693 exhibits the appropriations, expenditures, and balances under general heads, the balances being those which were undrawn on June 30 for the fiscal year 1888.

Estimates and Appropriations, 1889 and 1890.

The estimates for the Navy and Marine Corps for the current fiscal year amounted to £4,600,724; those for the next fiscal year amount to £5,353,535, a difference of £752,811.

Summary of Estimates for 1890 *for the Navy and Marine Corps.*

	£
Secretary's Office: Pay of the Navy, Pay Miscellaneous, and Contingent, Navy	1,554,755
Bureau of Yards and Docks	128,924
Bureau of Equipment and Recruiting	158,305
Bureau of Navigation	35,000
Bureau of Ordnance	49,196
Bureau of Construction and Repair	183,994
Bureau of Steam Engineering	162,780
Bureau of Provisions and Clothing	267,232
Bureau of Medicine and Surgery	24,500
Naval Academy	37,762
Marine Corps	184,365
For ordinary objects of Expenditure, carried forward	£2,786,813

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	£
Brought forward	2,786,813
Increase of the Navy (Construction and Armament)	1,943,400
Improvements of all kinds at Yards and Stations	442,849
For new Naval Observatory	48,000
For other Special Objects	132,470
Total	£5,353,532

ESTIMATES FOR 1890 INCREASED OVER APPROPRIATIONS OF 1889.

	£
Civil Establishment, Yards and Stations	767
Contingent, Bureaus	8,000
Increase of the Navy, Construction	428,000
Increase of the Navy, Armour and Armament	415,400
New Naval Observatory, Washington	38,000
Pay of the Navy	91,875
Pay, Miscellaneous	2,000
Steam Machinery	39,000
Construction and Repair of Vessels	15,000
Provisions for the Navy	31,759
Equipment of Vessels	15,000
Coaster's Harbour Island	3,200
General Maintenance, Yards and Stations	7,000
Improvement of Yards and Stations	21,818
Navigation and Navigation Supplies	8,000
Surveys and Charts	4,000
Marine Corps	977
Total	£1,129,796

Report of the Admiral.

The report of the Admiral of the Navy, dated July 18, 1888, presents interesting observations in regard to the apprentice system. He advocates the employment of sailing vessels for practice ships, and an enlistment for ten years, with the understanding that all the ratings of petty officer shall be open to apprentices. He deprecates too high a standard for admission and the holding out of forlorn hopes of promotion, as thereby recruits are obtained from too high a station to insure their remaining in the service as enlisted men. In reference to torpedoes the Admiral does not favour the Whitehead system, and cites the success of net defences. He speaks well of the Berdan ram-torpedo, the Ericsson submarine gun, and the Graydon shell. He also advocates the continuance of the War College as a most valuable factor in preparing officers for war service. As senior officer of the

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Board of Inspection he reports favourably on the condition and general efficiency of the ships inspected before going to sea and on their return.

Bureau of Ordnance.

The report of the Chief of the Bureau of Ordnance, Commodore Montgomery Sicard, contains a summary of the work of that important Bureau during the year.

Ordnance manufacture.

The work of constructing the ordnance for the new Navy is progressing slowly but surely. Exact results are required and much work has to be performed in experiment before they can be obtained.

The results, however, prove that we are not behind any nation in our power to adapt and design, and that our manufacturing conveniences are rapidly improving.

He reports the adoption of a new model for 6, 8, and 10-inch guns, which, without increasing the weight, adds to the strength of the gun.

Powder.

Good results have been obtained with American brown powder in 6-inch guns, and he expects soon to have satisfactory results with that for higher calibres.

He says that good results have attended the tests of the new square lozenge black powder in rapid-fire guns.

He states the necessity of a new form of powder which is being used abroad with wonderful results, but of which we do not know the process of manufacture.

Steel projectiles.

Good results have been obtained at last with cast-steel projectiles.

It has been possible to obtain two armour-piercing shells during the last year; if these give good results on trial, others can be procured similar to them.

Percussion fuses.

Fair progress has been made towards obtaining good forms of percussion fuses and electrical primers.

Gun mountings.

The work on gun-carriages has progressed considerably, and thirteen sets of castings for 6-inch central pivot carriages have passed the ballistic tests.

The Chicago's central pivot 8-inch carriages are completed. Steel deck circles and clips have been fitted to the Atlanta and Boston, and have given excellent results.

The first of the 10-inch turret carriages for the Miantonomoh has given good results at the Ordnance Proving Ground.

The Hotchkiss Ordnance Company is filling a large order for its

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guns, which are being constructed in this country after considerable difficulty in obtaining suitable material.

Several new forms of mounts for secondary battery guns have been devised by Lieut. F. F. Fletcher, and have given good results.

Fairly good results have been obtained with several marine guns submitted for trial.

In regard to the apprentice establishment, the Bureau reports fair results. The want of proper training-ships has been a great drawback, and the construction of new bark-rigged vessels of modern type is again recommended for use as practice vessels.

New tables of allowance for the new types of ship have been made and have been sent to the equipment depot.

Recommendations.

Commodore Schley concludes his report with some valuable recommendations in regard to the improvement of the men's messes, the increase of the pay of certain grades of petty officers and other enlisted men in order that the service may get a better class of men now required by the improvements in material; the extension of the retirement and citizenship laws passed for the Army and Marine Corps to the enlisted men of the Navy; and that power be given to naval officers to administer the oath of allegiance to recruits as is now done by officers of the Army.

Engineer Corps.

Under the head of "Personnel of the Engineer Corps," the Engineer-in-Chief calls attention to the number of engineers and machinists in our own and in foreign services, and asks for the appointment of an assistant chief of Bureau. He strongly recommends the establishment of a practice-ship for the men of the engine-room force, especially for those of the rating of water-tender, the latter having new and very important duties to perform in running the machinery of the new-type ships. He also recommends that all vessels fitted for forced draught should be run under forced draught until the engine-room force has become entirely expert in developing the highest powers of the ship. This would of course slightly increase the expenditure of fuel for a time, but without it the great extra cost of perfected boilers and machinery would be lost.

In regard to the rating of men as machinists, he recommends a more thorough examination.

The chief of the Bureau argues against the retention of vessels on active service, without thorough overhauling, for a period of more than three years, because by so doing the engines are entirely exhausted, whereas otherwise slight repairs render them thoroughly efficient for another cruise.

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Coil boilers.

The chief of Bureau reports that, being convinced of the important reduction in weight which the introduction of coil boilers would ensure, the Department issued a circular inviting manufacturers to submit plans of a boiler adopted for use in an armoured coast-defence vessel. In answer to this circular twenty-three firms applied for and were furnished with information, and nine submitted designs. Owing to the pressure of other business no decision has yet been reached as to which of these boilers will be tested.

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XIII.

REPORTS ON COALING STATIONS.

(Reprinted from the 'Army and Navy Gazette.')

GIBRALTAR AND MALTA.

Theoretically, these two positions have been rendered impregnable. Whether the result will justify such a theory remains to be proved Four 100-ton guns have been mounted in special emplacements at a cost of £70,000, two at each station; they have a range of about six miles out at sea, and an all-round fire. There is also a battery of 38-ton guns at Gibraltar, which cost, irrespective of armament, £57,480; and a number of weapons of a similar nature are included in the "dockyard defences" at Malta, for which £240,000 has been expended. These last-mentioned guns are most effective and reliable; but the 100-ton leviathans possess undesirable tendencies towards getting "out of action." It is said that emplacements are in course of preparation for a battery of heavy breech-loading steel guns upon the summit of Gibraltar Rock, at O'Hara's Tower, which has been removed to make room for them. This is certainly a step in the right direction, for a couple of 9·2-in. breech-loaders mounted there, with Watkin's position-finder to denote the range of passing vessels, would render an approach within six or eight miles an impossibility. O'Hara's Tower has a command of about 1200 ft., hence the chances of such a position being successfully shelled from an enemy's ships would be very remote indeed. Magnificent reservoirs for water, recently constructed at Gibraltar, would render it independent of the aid of condensing vessels, even during a siege. There are extensive reserved stores of preserved meat and biscuit retained at both places. Putting the numbers down at an average of, say, 500 guns for each fortress, which is a very modest computation, we should require at least for active duty and reliefs 20 men to each gun. This would necessitate 10,000 gunners at either place—nearly twice the strength of the entire garrison, including infantry, artillery, and departmental corps—to man the guns. Encouragement should unquestionably be given to the formation of volunteer artillery corps at both of these

Four 100-ton guns mounted.

38-ton guns.

Water reservoirs.

Provision stores.

Volunteer artillery.

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stations, and to the instruction of such volunteers in working the armament mounted in the local batteries. Egyptians stood to their guns well in Alexandria. Why should not "scorpions" do the same at Gibraltar, and the active little natives at Malta?

ADEN.

Aden has been enormously strengthened recently by the addition of heavy muzzle-loading rifled guns, mounted in rock gallery casemates, and commanding the harbours on both sides of the isthmus which connects the peninsula with the mainland. The protection of vessels lying in the west harbour, which is the one best known to travellers coming from or entering the Red Sea, and has capital anchorage with considerable depth of water, is further amply secured by batteries of 6-in. 5-ton steel breech-loading guns that were sent out last year, and are now mounted in position. Quick-firing guns, both 6-pr. and 3-pr. Hotchkiss, are to follow.

CEYLON.

At Trincomalee the fortifications for the defence of the harbour are nearly complete. The armament of several forts, including Forts Frederick and Osborne, has been thoroughly remodelled, huge magazines and fresh emplacements having been constructed for heavy guns, which are already mounted. These embrace a number of 7-in. and 9-in. rifled muzzle-loaders, but none of the new breech-loading steel guns have yet been supplied. The batteries on Sober Island are in working order, and on the mainland opposite there is to be a quick-firing machine-gun battery. Works are now in rapid progress at Colombo also, and a portion of their armament is in position. It is anticipated that this will shortly be supplemented with some batteries of 6-in. breech-loaders, and a proportion of quick-firing guns for sea-faces is also under consideration. The great want is gunners to man the batteries. A volunteer European and half-caste force might be made available out of the 20,000 in the island.

SINGAPORE.

Major McCallum, R.E., the Colonial Engineer, has made most praiseworthy efforts for the strengthening of its fortifications, and has been ably seconded by the assistance and money of its wealthier inhabitants. The works at Fullerton Battery and other commanding sites have been reconstructed at a cost of £100,000, and batteries of

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9-in. muzzle-loading guns and 8-in. steel breech-loaders of 15 tons have been despatched for their armament. The most powerful completed batteries are mounted with guns having a muzzle velocity of 2200 ft. per second, able to penetrate 15·4-in. of armour-plate at 1000 yards' range with a projectile weighing 210 lb. From Mr. Stanhope's speech it appears also that some 9·2-in. steel breech-loading guns and some 10-in. steel breech-loading guns are going out in February next. The works for these guns have been erected upon Bla Kan Mati Island, opposite the new harbour and docks, commanding, by virtue of elevation, the whole position and anchorage. A proportion of 6-pr. and 3-pr. Hotchkiss for all the works is also to be sent out. This will make the fortress one of the strongest out of Europe. Hence Singapore can afford to snap its fingers at the majority of foreign cruisers which are likely to come within range of its armour-piercing guns.

HONG KONG.

The anchorage of Hong Kong may be justly described as the Spithead of the East, for it is secured from all possibility of being seized by a *coup de main*, or shelled from a distance, by the fact that the island lies right across its front, in the same position as that occupied by the Isle of Wight with regard to the Solent. So long as both passages are sealed at either entrance to the anchorage, it is absolutely secure, as well as the town of Victoria. Hence the problem of effectually fortifying the narrow passage to the eastward called the Lye-ee-Moon Pass, and the Lammas Channel to the westward, has been that undertaken by Sir William Crossman in his defence scheme for the protection of the Colony. Let us briefly describe the situation of the town and harbour. Victoria lies upon the north shore of the island, facing due north; the anchorage stretches away on both sides, east and west. Opposite to Victoria the mainland of China approaches the island by a promontory called Kowloon, which has been ceded to Great Britain, and is only separated from Kong Kong by a channel one mile wide. The two limbs of the harbour thus formed are a grand expanse of ten square miles of water, and 100 vessels of large size may often be counted upon its capacious bosom. Behind the town of Victoria rises a steep mountain, crowning the whole of the island, at one time sterile and unproductive, but now, thanks to the energy of Sir Pope Hennessy, clothed with pines, small but strong and healthy looking, to its very summit. The azalea blooms all over the sheltered slopes of the Happy Valley. But planting pines was not the only effort of this energetic governor. During his term of office he intro-

Lye-ee-Moon Pass. Lammas Channel.

Sir Pope Hennessy.

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duced such a healthy economy into the financial matters of the island that a saving of £300,000 to the Colonial Treasury was the result. This saving accrued at a most opportune period. Just about this time the war scare with Russia was on the *tapis*, and with only very little assistance from the Home Government, the Colony resolutely set itself to work to render the town and anchorage secure from the danger of a hostile attack. Two thousand picked Chinese navvies were selected to form working parties, under non-commissioned officers and men of the Royal Engineers, and powerful redoubts were thrown up upon the island of Hong Kong, commanding both the east and west channels, and upon the Kowloon Peninsula opposite. The condition of affairs previously, so far as regarded the military protective features of the station, was truly shameful and discreditable to those concerned. The ordnance stores of the island contained nothing but obsolete *matériel*, and the only battery was a bastion of feeble trace, mounting a few "pea-shooters." Now, under the auspices of Sir William Crossman, all was remodelled, and an excellent armament was despatched from England. The report upon the defences of the coaling stations, to which allusion has so frequently been made of late years, was also now promulgated, and, amongst other places, it was decided to erect permanent works at Hong Kong. We will briefly recapitulate the more prominent features of the work which has been done, and we are encouraged to believe that the subject will possess more than ordinary interest, as Lord Brassey, in his paper on the coaling stations in the *Annual* for 1887, does not include Hong Kong. Commencing at the eastern entrance, the Lye-ee-Moon Pass, which is very narrow, we find a battery of 6-in. steel B. L. guns, which command it effectually. Within the pass, at the bluff forming the corner of Causeway Bay, are a series of powerful works mounting 9-in. and 10-in. M. L. R. guns, which sweep the whole of the eastern limb of the anchorage. Upon the west flank of the position we have a series of strong batteries, including 6-in. steel B. L. guns, and 9-in. and 10-in. M. L. guns, at the point near the gasworks, upon Green Island, and at Belcher's Point, which is the extreme western cape of the island; works upon Stone Cutter's Island and Kowloon Peninsula complete the chain of fortifications to the north and west. But this channel, called the Lammas, is not so easily defended as the eastern one. It is very broad, quite four miles. Fortunately, however, there are many shoal spots in it, and upon these an intricate system of mine-fields has been laid down by the Royal Engineers. With these, and the concentrated fire of all the batteries which are available, the entrance to the harbour from this direction is practically sealed. A

Russian war scare.

Sir William Crossman.

Defence works.

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quick-firing armament of 3 and 6-pounders Hotchkiss has been ordered for this station. It is a pity that the town of Aberdeen on the south-west of the island, which contains most of the graving-docks and the machinery for repairing vessels, was not included within the sphere of defensive operations. As it is now, that place is quite defenceless. But there are other docks upon Kowloon Peninsula, within the anchorage, some of considerable size and sufficiently deep to receive ironclads of moderate size or very large cruisers. They vary from 350 to 500 feet in length, with 29 feet of depth. The water supply of Hong Kong is excellent. It is brought through the mountains by a subterranean drift from a fountain-head on the opposite side of the island. The existence of an ample establishment of fairly well-trained men, for the working of the batteries in time of active service, is one of the most satisfactory features of this place. Eight hundred Sikh police have been stationed here since 1869, and these are constantly recruited from India. The Chinese also are capital gunners, and of course a proportion of Royal Artillery is always maintained for instructional purposes, &c. The Hong Kong Volunteers also were a well-trained body, and upon the occasion of war scares they have been always to the front in large numbers. Extensive depots of gun-cotton and submarine mining apparatus are kept in reserve at this station, and periodical testing of the mine-fields takes place. On the whole, we are inclined to think that Hong Kong is the best defended coaling station which we possess.

Aberdeen and its dry docks.

Kowloon.

Water supply.

Sikh police.

Hong Kong volunteers.

THE CAPE OF GOOD HOPE.

Lord Brassey has pointed out that, of all Colonies in the British Empire, the Cape Possessions are those which are capable of a most easy defence. Owing to their iron-bound coasts, they are only approachable at certain defined places; yet, singular to say, until quite lately, neither the Home nor Colonial Governments appeared to realise the defenceless condition of all those approachable spots beyond the immediate limits of Simon's Bay, and only a most imperfect means of communication—except by sea—existed between that most essential *point d'appui* and Table Bay; whilst—their interests are inseparably united—the guns were all located in the former place, though the docks which they should have been destined to protect were in the latter. But the same admirable energy which induced the Cape Colonists to tackle the undertaking of securing their anchorage at Cape Town, and to make it one of the best sheltered in the world by means of a splendid breakwater, superior

Lord Brassey's views.

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to that at Portland, has now inspired them with a vigorous policy of defence; and it is satisfactory to know that the War Department has been infected with a corresponding spirit of zeal, as it has taken up the question of fortifying Table Bay in earnest, by providing an adequate armament for it of recent weapons, and by despatching 100 men of the Royal Engineers to superintend working parties of local artisans and convicts in completing the fortification of strategic points. The funds for the erection of these works have been partially found by the Colonial Government. Simon's Bay has already been furnished with a number of excellent batteries of 9-in. R. M. L. guns of 12 tons: but Table Bay is to have a far heavier and more powerful armament. Several important works are in course of construction at the latter place, and are already well forward. One powerful casemated structure at Sea Point commands all approaches to the anchorage from a southerly and westerly direction. It is to mount 9·2-in. steel B. L. guns of the latest type; and some of these have already been despatched to their destination. This battery, which faces seawards, and is well outside of the peninsula forming the western limb of Table Bay, will prevent all possibility of an enemy's cruisers lying off and shelling the anchorage within, from a distance. The other batteries protect the entrance from the north. The 9·2-in. steel B. L. gun of 22 tons fires a projectile of 380 lb. weight, and has a penetrating power into 18·8 in. of armour-plates at 1000 yards range. Hence a couple of batteries of such weapons should enable the Cape artillerists to "perforate," at their pleasure the sides of an enemy's cruisers which should have the temerity to approach their shores. The works both at Simon's Bay and Cape Town are to be fitted with a proportion of quick-firing Hotchkiss guns. The railway to connect these two places is now in progress.

Table Bay.

Simon's Bay.

ST. HELENA.

£29,269 has been spent altogether upon the defensive works of St. Helena, irrespective of the cost of armament. This sum has been laid out judiciously, and bearing in mind the fact that Ascension has been abandoned as a protected naval station, we cannot fail to recognise the increased value which attaches to St. Helena as a midway port between the Cape and Sierra Leone. There are two new batteries of 9-in. R. M. L. guns which defend the approaches to St. James's Bay, the only inlet of consequence which the island contains, and that which is the site of the coal depots and of the small town of the same name. As these works have considerable

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command to seaward, they are excellently placed for the security of the port, and they are reinforced by other batteries of 7-in. guns, also covering the anchorage. There is, moreover, another battery of these guns upon a high hill in the centre of the island. It is probable that these works would be sufficiently strong to deter any stray cruisers from attempting to force an entrance for the purpose of destroying the coal depots, and it is unlikely that a belligerent Power would detach a fleet for the purpose.

JAMAICA.

Jamaica has been treated rather cavalierly in the scheme of defence, although it is a position of considerable consequence as a coaling station, in that it possesses the finest harbour and the only dockyard in the West Indies. Lord Brassey points out, with great justice, the extravagance exhibited in the items of expenditure for this last-mentioned establishment. It appears to be only suited for obsolete and diminutive vessels, and the supervision of repairs there costs annually ten times the value of the repairs executed. But the persistence of the French engineers in carrying out the project for a canal across the Isthmus of Panama develops features of interest hitherto non-existent in the position of Kingston Harbour, in Jamaica, as it is only two days' steaming from the town of Aspinwall, and would certainly be selected for an observing station in the event of complications involving the new canal route when finished. Port Royal, which commands the approaches to the anchorage of Kingston Harbour, is defended by several important works, including Apostles Battery and Fort Augusta, which are judiciously situated, having high command. Their armament consists of batteries of 10-in. R. M. L. guns of 18 tons, and others of less calibre. No modern breech-loaders have as yet been mounted there. A sum of £9000 has been voted for increasing the magazine accommodation at the station, and the necessary alterations are being carried out. But, in its present condition, an enemy's ironclad fleet, with long-range guns, could lie off the eastern arm of Kingston Harbour and shell that town, together with the naval establishment at Port Royal, without any defence being possible, as the carriages of the guns only admit of elevation up to seven degrees, and this would only cover a range of two and a quarter miles. Jamaica is, therefore, in a "parlous state," irrespective of its dockyard arrangements, which require extensive overhaul.

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